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# BRITISH FUNGI

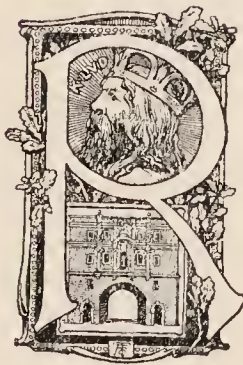
WITH A CHAPTER ON LICHENS

BY

GEORGE MASSEE

ASSISTANT KEEPER, HERBARIUM, ROYAL BOTANIC GARDENS, KEW

WITH FORTY COLOURED PLATES BY IVY MASSEE



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## PREFACE

THE primary object of this book is to enable the reader to determine the names of our indigenous mushrooms, toadstools, etc. At the same time, if a desire to know more than a mere string of names has not been aroused, then I have failed in my object. Many thanks to my colleague, Mr. A. D. Cotton, for much valuable assistance.

GEO. MASSEE.





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# BRITISH FUNGI

## PART I

### CHAPTER I

#### GENERAL INTRODUCTION

IN a book dealing with fungi, naturally the first question to be asked by an intelligent student is: What is a fungus? This suggests other questions: Is a fungus a plant, and, if so, why so? Now it must be admitted that these may prove to be very difficult questions to answer. Much depends, in fact all depends, on the relative amount of knowledge possessed by the inquirer. If a general elementary knowledge of the main differences between plants and animals has already been attained, the answer is fairly easy to grasp; if no knowledge on these points is possessed, no answer to the queries can be given that can convey any clear meaning. Assuming it is understood, as a general rule, that animals require organic food, that is, food which is the direct result of some living organism, as when a cat eats a mouse, a cow eats a cabbage, or when we eat bread; and that green plants are practically independent of food that is the direct product of life, but obtain what they require from the atmosphere, and from substances dissolved in water absorbed by the root. If so much is known, it will probably also be known that the green colouring matter called chlorophyll, present in the great majority of plants, is the substance that enables plants, under the influence of light, to convert the inorganic substances obtained from the air and the soil into plant flesh. Now fungi differ from the great majority of plants in having no chlorophyll, hence they cannot utilize inorganic materials obtained from the air, and from the soil, as food, but require organic food; some grow as parasites on living plants, others obtain their food from dead plants, wood, etc., or from humus or manure, all these being the direct result of life. In so far fungi agree with animals. On the other hand, fungi do not at all agree with animals in structure, or in their mode of reproduction, etc., but, on the other hand, fungi do agree in structure with plants having chlorophyll; hence

fungi are true plants, but owing to the absence of chlorophyll, require organic food. Fungi are not unique in the Vegetable Kingdom in this matter. Many plants belonging to different natural orders, that once had chlorophyll, have for some reason become devoid of chlorophyll, and consequently have to obtain organic food either as parasites, as the broom-rapes, or as saprophytes, as the birds'-nest orchid.

The fungi as a group are considered as having evolved from the algæ, or seaweeds; hence, as would be expected, the oldest and most primitive types of fungi are aquatic in habitat, and in many instances closely resemble certain algæ in structure, differing mainly from algæ in the absence of chlorophyll, so at this stage of evolution it may be said that fungi are algæ devoid of chlorophyll. This, of course, implies a change of food, as, owing to the absence of chlorophyll, our fungi cannot utilize inorganic food. Another point of importance to remember is the fact that, in the primitive fungi, the reproductive bodies or spores possess the power of spontaneous movement, that is, they can, by the aid of one or more slender prolongations of the substance of the spore, called *cilia*, swim about for some time in the water into which they are liberated. Such reproductive bodies are called *zoospores*. This power of spontaneous movement enables the zoospores to reach places suitable for germination and the production of a new fungus. Up to the present phase of evolution it is only possible to consider the fungi as other than modified algæ, in the sense that a mistletoe or a broom-rape is off the normal track of a typical flowering plant. It was when the fungi commenced to leave their original aquatic habitat and encroach on dry land, that the first really important modifications of structure were initiated. So long as fungi remained aquatic organisms, zoospores were the ideal type of reproductive bodies, but in endeavouring to extend their range on dry land, they were very much handicapped by only possessing zoospores, which necessitated the presence of water for their dispersion. It may be mentioned at this point, that in the ancient aquatic fungi the reproductive bodies or zoospores were in most instances the result of fertilization, or due to a sexual process. Once established on dry land, a new form of reproductive bodies was gradually evolved, of an entirely asexual origin, called *conidia*. These conidia, or asexual reproductive bodies, are in most instances exceedingly minute, dry, and so constructed that their dispersion could be effected by wind, insects, and other aerial agents. Now it was just the evolution of the conidial form of reproduction, capable of being scattered by wind, that enabled the fungi to gradually take possession of every portion of dry land inhabited by higher plants, from which they could obtain the required food. From the above account it will have been gathered that the fungi, at the time of their evolution from the algæ, and on their first endeavours to gain



a foothold on dry land, possessed two distinct types of reproductive organs, the primitive type of sexually produced ones, and the modern or conidial form, evolved soon after their adoption of an aerial home. So successful has this modern conidial form of reproduction proved to be, that in the great majority of instances the older sexual mode of reproduction has been abandoned. In the thousands of gill-bearing fungi or toadstools, also the woody bracket-fungi; in other words, in the extensive group of fungi technically known as the Basidiomycetes, there is not a vestige of the ancient sexual form of reproduction left, and all these fungi are reproduced by the newer conidial method. It may be stated that the Basidiomycetes is the most modern group of fungi, that is, it is the last to evolve from the series of families that have come into being, or gradually evolved one from another, since the fungi became terrestrial in their habits. For this reason the Basidiomycetes may also be looked upon as representing the most marked type of true fungi, and have shaken off all the indications of their origin from the algæ; in fact, if the Basidiomycetes amongst the fungi alone existed at the present day, it could not have been suggested that they had evolved from the algæ; other groups of fungi, from which the Basidiomycetes originated, however, clearly indicate such origin.

Where two or more distinct forms of reproductive bodies are present, which is general in all groups except the Basidiomycetes, as previously defined, each form of reproduction has its own special function sharply defined. The function of the conidial stage, which may be looked upon as a supplementary one, evolved to meet new conditions when the fungi adopted dry land as their habitat, is for the purpose of extending the geographical area of the species, whereas the ancient sexually produced fruit is produced for the purpose of continuing the species in time, or from one season to another. This comes about as follows. Probably the white mildew, so common on the leaves and stems of roses, both wild and cultivated, is familiar to all, or at all events may soon become so, on account of its great frequency, by anyone sufficiently interested in the subject. Now if a mildewed rose leaf is examined with a pocket-lens, the white mildew will appear to resemble a thin coating of wheat flour dusted on the leaf. If a minute portion of this meal, placed in a drop of water, is examined under a microscope magnifying about three hundred times, the apparent powder will be seen to consist of colourless, oblong bodies, or conidia, or *summer-spores*, as they are often called. These conidia are capable of germination the moment they are mature, and being readily dispersed by wind, insects, birds, etc., some are certain to alight on the leaves of other rose trees, which become infected and quickly produce a crop of conidia which are dispersed in turn, and infect other plants. The production of this conidial form of reproduction continues throughout the growing season, and as myriads of

these conidia, each capable of infecting a plant, are produced daily throughout the season, it can be readily understood how quickly a disease can spread, not only from one plant to another in the same garden, but from garden to garden, and even from one country to another. Conidia are very short-lived, usually only retaining the power of germination for a few days, after which they perish. Now if I have succeeded in making myself understood so far, my previous statement that the use of conidia or summer-spores is solely to enable the fungus to extend its area of distribution will be clear. All epidemics of fungi, that is, those exceptionally abundant outbreaks of fungus growth which so frequently prove destructive to cultivated crops, are invariably due to the rapid development and extension of the conidial stage of the fungus.

To return to our mildewed rose bush. If the white mildew patches on the shoots are examined during the autumn, minute blackish dots, smaller than the head of a small pin, may be seen on the white cottony patches of mildew. These small black balls are the ancient, sexual, or winter form of fruit. Their structure is complicated, and cannot be understood without microscopic examination. For the present it must suffice to state that each little ball or fruit contains several spores in its interior. These spores, unlike conidia, will not germinate at once, but require a period of rest before they will do so, in fact, they will not germinate until the spring following their production. When spring arrives the little balls decay, liberate their contained spores, which are carried about by wind, etc.; those that happen to alight on young rose leaves set up an infection, which results in the production of a patch of mildew, and the cycle of development, first conidia, then *winter-spores*, is repeated.

The above account briefly indicates the general outlines of the division of labour, in so far as the methods of extending the area of distribution and the continuation in time is concerned, of many thousands of different kinds of fungi.

At this stage it may be well to attempt to define the meaning of the terms conidium (= singular of conidia), and spore. A conidium is a reproductive body, equivalent in value to the seed of a flowering plant, as a pea or an acorn, but it is asexual in origin, that is, it is not the result of an act of fertilization. A *spore* is the result of an act of fertilization, the sexual organs being equivalent in function to the stamens and pistil in flowering plants. In the great majority of fungi the actual act of fertilization is arrested or obsolete now, but the general structure of the fruit-body is the same as when fertilization occurred, and the bodies produced in such structures are still called spores. Unfortunately this distinction between conidia and spore is not consistently followed; the reproductive bodies of the gill-bearing fungi, and of the Basidiomycetes collectively, are by common consent called spores, although they are



technically conidia as defined above. Within the seed of a flowering plant there is an embryo, or miniature plantlet; such embryo is entirely absent from both conidium and spore, hence they are not botanically seeds, although functionally both are exactly equal in value to a seed, in the sense that each is capable, under favourable circumstances, of germination and giving origin to a fungus.

Soon after the fungi emerged from their primitive aquatic home, and took possession of dry land, they quickly shook off the algal characteristics of their ancestors, and clearly indicated the evolution of a new group of organisms, collectively known as fungi, distinguished from all other large groups constituting the Vegetable Kingdom by their structure and mode of life. Such was their energy and adaptability, that it is important to bear in mind that, numerically, fungi at the present day rank next to flowering plants, and in many portions of the globe far exceed them. For instance, in Great Britain we have just over five thousand species of fungi, a number which exceeds that of our flowering plants, ferns, mosses, hepatics, algæ, and lichens all added together. Probably the same would be true of many other regions if the fungi were as carefully collected and studied as are the higher forms of plant life.

In addition to the peculiarity of possessing two or more forms of reproductive bodies—some fungi have more than one form of conidia—many fungi possess the remarkable property of living, or spending one part of their life-cycle on one host-plant, and the remaining portion on another distinct plant. This mode of life is termed *heterœcism*, and such fungi are said to be heterœcious, or living on different substances during different periods of their growth. This peculiarity is most marked in the fungi termed “rusts,” as corn rust, or mildew, as it is sometimes called.

The common corn rust, *Puccinia graminis*, illustrates this mode of life, and although the fungus itself is not likely to be known by the reader, yet the general principle may be grasped from an explanation of the cycle of development of this fungus. We will commence with the winter-fruit, which is produced on the fading leaves and culms of wheat and some other grasses. These winter-spores, as usual, require a period of rest before they can germinate, in fact, such spores germinate in the spring following their production. On germination the winter-spores give origin to yet smaller spores, which are drifted about by wind, and those that happen to alight on the young leaves of the barberry (*Berberis vulgaris*) set up an infection which eventually results in the development of the beautiful structures known as “cluster-cups,” on account of the cup-like structures containing the spores. This is the first stage of the fungus, produced in the spring, on barberry leaves. The minute spores produced in the “cluster-cups” are in turn dispersed by wind, and those that alight on the young

leaves or leaf-sheath of wheat or other grasses in due course give origin to the conidial or summer stage of the fungus, which appears under the form of short orange streaks on the leaves, etc. The first-formed summer-spores, scattered by wind, etc., infect neighbouring plants, and as the production of summer-spores continues throughout the growing period of the *host-plant*, that is, the plant upon which the fungus is parasitic, it can be readily understood how quickly, under conditions favourable for the fungus, the disease spreads and becomes epidemic, when the host-plants are crowded together, as in a field of wheat. When the wheat is commencing to ripen, summer-spores cease to be formed, and the same mycelium that has produced them hitherto, now produces winter-spores, or *resting-spores*, which remain firmly attached to the leaves and straw until the following spring, when they germinate and infect barberry leaves, and the cycle of development, as described above, is repeated.

The above describes the fullest development of wheat rust, but under certain conditions, one or other of these phases in the life-cycle of the fungus may be dropped or omitted, without in any way interfering with the appearance or development of the remaining stages. For instance, wheat rust in some way accompanied its host-plant into the Southern hemisphere, and at the present day is much more injurious to the wheat crop in Australia than it is in Europe. But it so happens that for some reason, climatic, or the absence of a suitable host-plant, the *æcidium*, or "cluster-cup" condition of the fungus was completely omitted, so that the uredo or summer form, and the telentospore or winter form of fruit are alone produced in Australia. Again, where the wheat rust has been introduced into sub-tropical or warm temperate regions, where the host-plant is growing all the year round, the uredo or summer form of fruit is often alone produced, as there is an unbroken continuity of proper host-plants for favouring the continuous growth of the summer form of fruit.

At this point the question that naturally suggests itself is, why all these changes of mode of life in one kind of fungus? At present no one can offer a full explanation, yet much is known bearing on this subject. A celebrated German scientist named Klebs has proved, as the result of a long series of experiments, that in the case of many fungi, a perpetually sterile condition, or a constant production of the conidial form of fruit, or of the sexual form of fruit, can be produced at will, the most important determining factors being the particular composition, and proportion of the food supplied, along with certain physical conditions, as the density of the medium in which the fungus is growing, etc. Now we have already learned that when a wheat plant is infected with wheat rust, uredo or summer-spores continue to be produced in rapid succession so long as the host-plant is still growing and



vigorous, but when it commences to ripen, that is, to die gradually, the same mycelium that had previously produced summer-spores now commences to produce winter-spores, whose general form and function, or use, are totally different to those of summer-spores. The transition is not abrupt when the plant first begins to ripen, the clusters of spores often contain both summer and winter forms, and as the ripening or dying of the wheat plant progresses, summer-spores entirely disappear, and are replaced by winter-spores. This change in the habit of the fungus we attribute to changes taking place in the host-plant. During active growth the chemical composition and physical conditions, as to density of the tissues, etc., are fairly constant, and favour the development of summer-spores, but when the ripening or dying stage is reached, the difference in the chemical condition of the sap, also its quantity, and the greater rigidity of the tissues, together prevent the further production of summer-spores, but favour the production of winter-spores. The general significance of this idea will be more evident as the student progresses in the study of fungi; but from the first the fact cannot be overlooked that the great majority of fungi that grow on a host that changes as indicated above, produce two forms of fruit, conidial and ascigerous or winter-fruit, whereas fungi that grow on a comparatively unchangeable substance, as rotten wood, humus, etc., show no change of form, and as a rule produce only one kind of spore, as in toadstools, bracket fungi, in fact throughout the thousands of species included in the Basidiomycetes. It is amongst the rusts generally, and more especially the numerous members of one particular genus, called *Puccinia*, that we meet with the greatest variety in the number of different kinds of spores produced, and also in growing on different hosts during different periods of their development. Evidence points to the conclusion that all these fungi, at one time or other, possessed the three forms of spore as described under wheat rust, and also that there was at one time a sexually produced condition. The last has now entirely disappeared, functionally, but vestiges remain. At the present day in many species, for unknown reasons, various spore-forms have dropped out, or are omitted in the cycle of development. In some species only the resting-spore or winter-spore stage remains. The well-known and destructive hollyhock rust (*Puccinia malvacearum*), forming small, hard brown warts on the leaves and stem, illustrates this condition of things. This fungus, along with allies, appears to have solved the problem of effecting their requirements with the least possible expenditure of energy and material. In the majority of instances, a continuous succession of summer-spores throughout the growing season of the host, followed by a crop of winter-spores, are necessary for the continuation of the fungus in space and time. In the hollyhock rust, the only spore formation left corresponds structurally to the winter-spore stage of allied fungi.

But in this one kind there is a division of labour which enables these spores to perform the functions of summer-spores and winter-spores respectively. The spores developed throughout the summer on hollyhock leaves germinate the moment they are formed, and produce myriads of smaller spores while yet attached to the leaf. These smaller spores are dispersed by wind and infect adjoining plants, thus playing the part of summer-spores. During the autumn, when the leaves are fading, the spores produced on the leaves, which agree exactly in structure with those produced during the summer, do not germinate on the leaves and produce minute secondary spores, but act as true winter-spores, remaining in a resting or unchanged condition until the following spring, when they germinate and produce secondary spores, some of which are deposited by wind, etc., on the young hollyhock leaves to commence the cycle of growth once again.

It has already been stated that the primary object of the evolution of a conidial phase of reproduction was to secure the dispersion of the reproductive bodies of fungi by wind. As the terrestrial forms of fungi gradually enlarged their sphere of action, unusual conditions had to be met, and consequently adaptation to circumstances followed; certain groups, including the truffles and allies, elected to adopt an underground mode of existence. Now under such conditions the spores could not possibly be dispersed by wind, but we find that all such underground fungi possess a very powerful scent or smell. This smell is for the purpose of indicating to animals, mostly rodents, their whereabouts. When discovered, they are promptly unearthed and eaten. The spores pass through the alimentary tract uninjured, and are thus dispersed. The strong smell is only in evidence when the spores are mature and ready for dispersal, otherwise the point would be missed, and the plants unearthed in an early stage of development.

In some other groups of fungi, more certain methods of spore dispersion than by wind have gradually been evolved, and perhaps the most perfect arrangement is met with in the family called Phalloidaceæ, of which the well-known "stinkhorn" (*Ithyphallus impudicus*) is a British representative. The species included in this family are mostly met with in tropical countries. There are only about half a dozen European representatives, three of which occur in England. The fungi included in this family are remarkable for their very varied and peculiar shapes; the British species are comparatively simple in form. In many tropical "stinkhorns" there is a large, open-meshed, crinoline or skirt-like structure, spreading out below the cap; in others the shape closely mimics that of an expanded sea anemone, in others the general structure is club-shaped, with many branch-like outgrowths from the upper portion, while in the rare British species called *Clathrus cancellatus*, the entire fungus resembles a hollow sphere, the wall of which



consists of a large, irregular network (Plate XXXVI, Fig. 8). In this family the spores are exceedingly minute, and when they are mature, become involved in a semi-liquid, greenish-olive slime, which has a very sweet taste and a very strong, abominable smell. The peculiar outgrowths and shapes of these fungi described above are often brilliantly coloured, most frequently some shade of red, and down these structures the slime containing the spores trickles, until



Cap of the stinkhorn (*Ithyphallus impudicus*), with several "bluebottle" flies feeding on the strong-smelling mucus containing the minute spores.

they are more or less covered with a glairy mass. Now flies of various kinds devour this slime greedily, and consequently swallow the spores, which are eventually deposited here and there, many of which in due course germinate and produce the fungus in a new locality. The object of all these apparently fantastic shapes presented by different members of the family is for the purpose of enabling the slime containing the spores to spread over a considerable area, and thus afford a landing-stage for a considerable number of insects at the moment the spores are ready for distribution.

The brilliant colours, combined with the strong, penetrating smell, may be considered as advertisements, indicating to flies the whereabouts of a meal. The flies, unconsciously, disperse the spores.

It is somewhat remarkable that in flowering plants scent and colour serve as guides in securing fertilization through the agency of insects, whereas in fungi the same factors, again through the agency of insects, effect the distribution of spores.

In writing books I have always kept one pet ideal in view, that is, never under any circumstances to anticipate, or in other words, never to assume that the reader does understand a given term or phrase which my own conscience clearly tells me he cannot be expected to understand. Unfortunately I have never nearly approached to my ideal in this respect, and I feel equally certain I never shall. So far as I can see, this could only be accomplished by making every chapter the first chapter.

Before closing this introductory portion, I wish to draw attention to a very beautiful and obvious sequence of evolution, or gradual accommodation to circumstances, as illustrated in the different families of fungi collectively constituting the large group called Hymenomycetes. But what are Hymenomycetes? The definition is given later on in the book. Those who do not realize the significance of the term Hymenomycetes and the families included, must return to this portion after the characters of the large groups of fungi have been mastered.

In the Basidiomycetes, the general evolution of the group is very marked in two particulars of primary importance, namely, securing the greatest possible spore-bearing surface or hymenium with the least possible expenditure of material; and secondly, modifications of structure for the purpose of protecting the hymenium from adverse climatic conditions, rain, dust, etc., also from living enemies, snails, slugs, etc.

The simplest types of structure are met with in the family Thelephoraceæ, where many species of *Corticium* (Plate XXXIII, Figs. 1, 3, 5, 6), etc., resemble patches of paint or whitewash on dead wood, branches, or dead leaves. In such the entire exposed surface, which is perfectly smooth or even, consists of hymenium, and pointing upwards, is fully exposed to the dangers indicated above. In the genus *Stereum* (Plate XXXII, Fig. 8), the hymenium is yet quite even, and a portion of the fungus usually remains flat on the surface of the wood, as in *Corticium*; but in many instances the uppermost portion of the fungus becomes free from the wood it is growing upon, and arches over, or spreads at right-angles to its support. This change places the hymenium or spore-bearing portion on the under surface of the free or projecting surface of the fungus, and is the first primitive attempt to protect the spore-bearing portion of the fungus from rain and dust.

In the Clavariaceæ no attempt is made to protect the hymenium



from external dangers, but considerable evolution is evident in the way of producing a greater spore-bearing surface from an equal amount of material. In *Clavaria pistillaris* (Plate XXXIV, Fig. 6) we have a large, fleshy, club-shaped fungus, the even surface of which bears spores everywhere. Now if we examine *Clavaria cinerea* (Plate XXXIV, Fig. 5), we at once realize that it contains actually less material or weight of substance than *C. pistillaris*, but as the substance is broken up into numerous branches, each entirely spore-bearing throughout its surface, we grasp the fact that *C. cinerea*, by becoming broken up into numerous branches, can produce more spores than the heavier *C. pistillaris*. *Clavaria aurea* (Plate XXXIV, Fig. 8) illustrates to what extent branching, for the purpose of increasing the spore-bearing surface, is carried in the family. Notwithstanding the great advance made by the members of the Clavariaceæ in the increase of the hymenium or spore-producing surface, by gradually breaking up a solid mass of tissue into a much-branched, tree-like structure, the idea was not perpetuated in succeeding families, due probably to the entire absence of protection to the hymenium, all the species growing upright, and having the hymenium exposed from first to last.

In the Hydnaceæ we observe a marked advance, both in securing a greater spore-bearing area, and in protecting the same. In the simpler genera, as *Grandinia*, the hymenial surface is densely covered with minute warts, which collectively expose a much greater area than the perfectly smooth surface in *Corticium*. The line of development followed is the gradual conversion of warts into densely crowded, elongated spines, as seen in *Hydnum repandum* (Plate XXVII, Fig. 7). From the protective standpoint, the fungi included in this family evolve by transitions from the crust-like expansions of *Corticium*, through the partly free portion as described in *Stereum*, to a symmetrical, umbrella-shaped structure with a central stem, and having the hymenium composed of spines arranged on the under surface of the cap, and thus protected against rain, dust, etc., as in *Hydnum repandum*. The conception of increasing the spore-bearing area, by covering the surface of densely crowded spines with the hymenium, dropped out with the Hydnaceæ; and in the next family, the Polyporaceæ, we meet with numerous pits of various degrees of depth crowded on the spore-bearing surface, the walls of the depressions being covered with the hymenium. In some genera, as *Merulius* and *Polystictus* (Plate XXXI, Fig. 4), the pits or pores are quite shallow, whereas in the higher species, as *Boletus* (Plate XXXVII, Figs. 1, 3, and 4), the pores are up to half an inch deep, or sometimes more, the wall of the entire inner surface of each pore bearing spores. The sequence of progression of the fungus ranges from a plate-like crust, as in *Poria* (Plate XXXI, Fig. 3), through horizontal forms, as in *Polystictus* (Plate XXXI, Fig. 4), to species with a convex cap,

bearing the hymenium on the under surface, and supported on a central stem, as in *Boletus* (Plate XXXVII, Figs. 1, 3, and 4).

In the Agaricaceæ, the most highly evolved family included in the Basidiomycetes, the idea of securing a large area is obtained by thin plates or gills radiating from the stem to the edge of the cap, and placed for protection on the under surface of the cap, as in the common mushroom and all toadstools. Considering the amount of material used, the enormous surface area afforded by the gills,



*Polyporus hispidus*. The fungus has grown very quickly, and has enveloped some pieces of rope that were hanging down from a branch above.

which are completely covered on both sides by the hymenium, this arrangement is far in advance of the arrangement furnished by any previous family. In all the higher forms the cap resembles an open umbrella, supported on a central stem, and the cap literally acts as an umbrella, in protecting the gills from rain and dirt. In many kinds, in addition to the protection afforded the gills by the cap, they are also protected by a membrane stretching from the stem to the edge of the cap.

It must not be imagined that the special characters presented by



each family respectively, for increasing the area of its spore-bearing surface, are sharply confined to such families. The special features indicated are distinctly marked only in the most typical species, but every family includes species hovering on the border-line between one family and another, and it is often a purely personal opinion as to whether a given species should be included in one family or another. As an illustration, the genus *Dædalea* (Plate XXXI, Fig. 5) hovers between Polyporaceæ and Agaricaceæ. The hymenium is intermediate in structure between true pore and gill arrangement, in some specimens pores predominate, in others the arrangement is mostly gill-like. On account of its woody consistency and general durability, *Dædalea* is placed in the Polyporaceæ. There are no such things as sharply defined families, or genera, or species in nature ; such exist only in books.

## CHAPTER II

### SOME TERMS USED IN DESCRIBING FUNGI

MANY of the terms, as *apex*, *base*, *edge*, or *margin*, etc., are self-explanatory; to those familiar only with the English language, others are not.

The general structure of fungi is so different to that of flowering plants, that, as would be expected, quite a distinct set of names or terms is used in describing them, and unless the student in the first instance makes himself perfectly familiar with the terms in general use, he will not be in a position to make much headway in the study of fungi.

The method followed will be to take the various structures and parts collectively constituting a complete fungus, and indicate the terms most generally in use.

A perfectly developed fungus in a living condition consists of a *vegetative* portion, which has only to do with the welfare of the individual, whereas its *reproductive* portion is only concerned in providing for the continuation or repetition of the same kind of fungus in time.

#### *Vegetative portions*

The universal vegetative portion in the higher fungi is known as *mycelium*, or *spawn*, and is usually buried in the substance or *substratum* on which the fungus is growing. It consists of very delicate threads or *hyphæ* (singular, *hypha*), which usually run together and form snow-white, fleecy masses. Its function is primarily to obtain food. In many instances the mycelium is *annual* in its duration, or lives for only one season, perishing after it has produced fruit. In other instances the mycelium is *perennial*, or continues to live for several years, and producing fruit each season. In other instances the mycelium becomes modified in structure, and forms solid, hard masses, usually black externally, and varying in size in different species from a pea to that of a cricket ball, sometimes much larger. Such bodies are called *sclerotia* (singular, *sclerotium*), and after remaining in an unchanged or resting condition, are capable of producing fruit-bodies. Sclerotia are met with in every group of fungi, and are often produced by the mycelium when conditions are not favourable for the production

of fruit, or when the end of growth of the fungus is at hand, owing to the dying of the plant on which it is growing. Another form of condensated hyphæ, becoming covered with a blackish crust or *cortex*, and forming long, branched strands as thick as an ordinary knitting-needle, are not uncommon, and are termed *rhizomorphs*. These bodies travel underground, and here and there produce fruit bodies. Such rhizomorphs are in reality only very much elongated sclerotia.

### *Reproductive portions*

The reproductive portion is commonly considered as representing the entire fungus, as in the case of the common mushroom, whereas in reality it only represents the fruiting portion, the vegetative part being left in the ground. The mushroom or other fungus, as we commonly see it, being practically the equivalent of an apple, plum, or other fruit of a flowering plant. The general bulk of the fungus fruit has received various names: *sporophore*, or the portion whose function is to produce the spores, being the most comprehensive. In the fungi, spores are produced in two totally different ways. In one large group the spores are produced on the outside of specialized cells termed basidia (to be defined later); to this class belong all the toadstools, puffballs, bracket-fungi, etc., and in such cases the fungus fruit is called a *sporophore*. In another large group of fungi, including the morels, cup-fungi, etc., the spores are produced inside a large specialized cell called an ascus. All such fruit bodies are called *ascophores*. In the puffball family the fruit body is usually termed the *peridium*.

We will next take the terms used in describing the various parts of a toadstool or agaric, selecting one showing practically all the parts present in one of the most highly developed forms.

### *In the young, unexpanded stage*

If we examine Fig. 5 (Plate A), which represents a slice or *section* through a young, unexpanded agaric, we observe that the whole structure is enclosed in an unbroken membrane, *e*, called the *universal veil*. The use of this membrane is to protect the agaric in its youngest condition. In many agarics the universal veil is entirely absent. As the agaric increases in size, the universal veil, which does not continue to grow, becomes ruptured, as shown in Fig. 1 (Plate A), where *e* is the lower portion of the universal veil, surrounding the base of the stem as a sheath, and now called the *volva*. The upper portion of the universal veil is usually carried up by the cap of the agaric, and is torn into patches as the cap expands, as shown in Fig. 1 (Plate A). These loose patches or warts can easily be rubbed off the surface of the cap without breaking its surface, and must not be confounded with true scales formed from the skin of the cap. If we return to Fig. 5 (Plate A),



## PLATE A

1. Agaric, showing cap, *a* ; gills, *b* ; stem, *c* ; ring, *d* ; volva, *e* ; remains of volva on cap, *f*.
2. Section of Fig. 1. The letters refer to the same parts.
3. Section of a cap ; umbonate cap and adnate gills.
4. Section of a cap ; gibbous cap and adnexed gills.
5. Section of Fig. 1 in a young condition. The letters refer to the same parts as in Figs. 1 and 2.
6. Section of a puffball, showing the peridium, *a* ; gleba, *b* ; columella, *c*.
7. Section of convex cap with sinuate gills.
8. Section of infundibuliform cap and decurrent gills.
9. Basidia bearing spores, accompanied by paraphyses.
10. Ascus containing eight spores, accompanied by paraphyses.
11. A dimidiate or bracket-shaped fungus.
12. An adnate fungus.
13. Section of an umbilicate cap and free gills.
14. Section of a species of *Fomes*, showing stratified tubes.



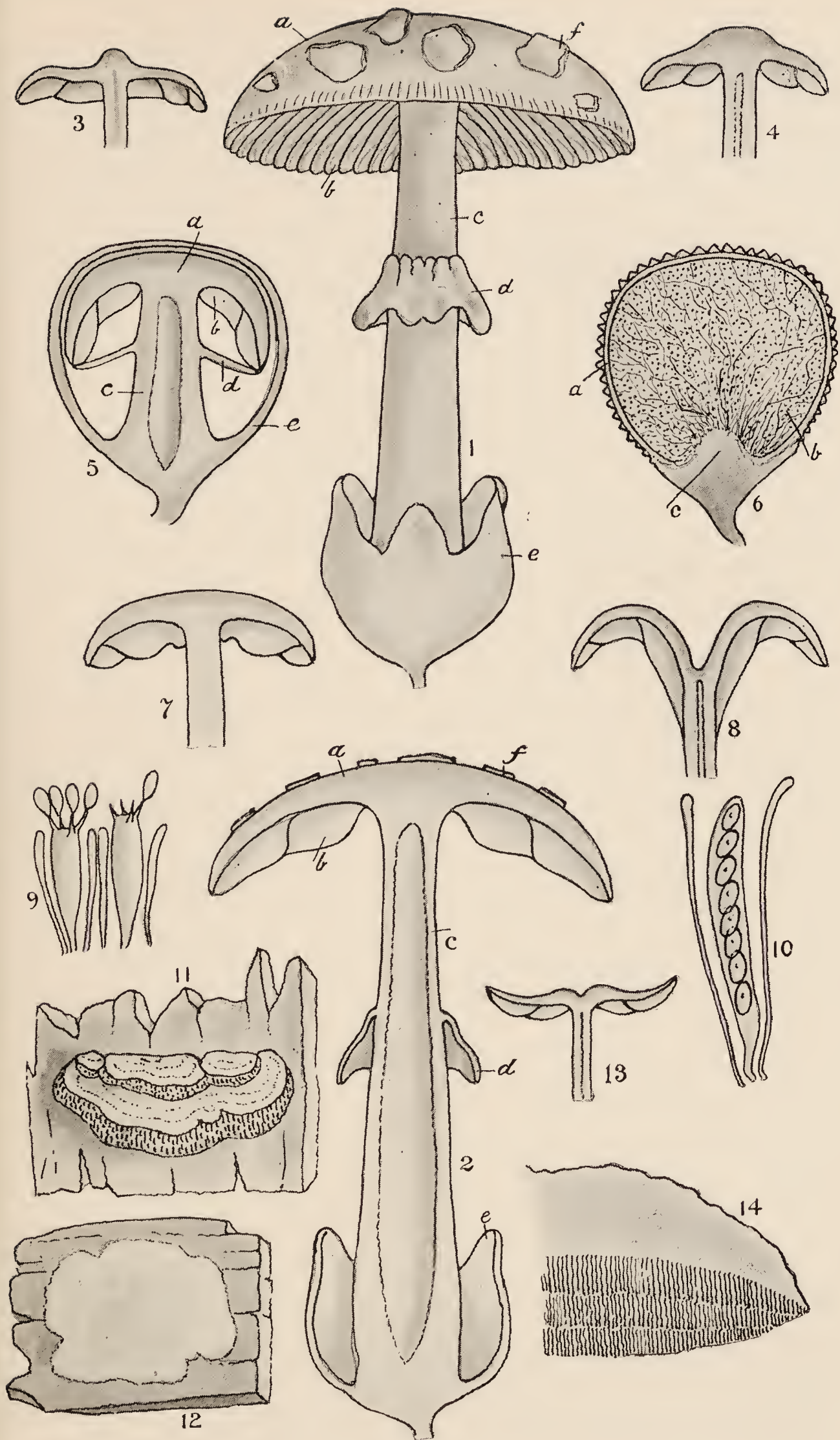


PLATE A

we notice that a thin membrane, shown as a line in the section at *d*, connects the edge of the cap with the stem. This is the *secondary veil*, which hides and protects the gills in the young condition. As the fungus expands this secondary veil breaks away from the edge of the cap, and forms a *ring* or *annulus* round the stem, as shown in *d* (Fig. 1, Plate A). In some instances, when the secondary veil is very thin and imperfect, it is torn, and hangs in shreds round the edge of the cap, instead of forming a ring round the stem. In many agarics the secondary veil is entirely absent.

We may next proceed to enumerate the various terms used in describing generally the parts constituting an agaric. These can be understood from an examination of Fig. 1 (Plate A). Fig. 2 is a median section through Fig. 1, and the lettering refers to the same structures in each figure; *a* is the cap or *pileus*; *f*, the patches of universal veil on its surface; *b*, the gills of *lamellæ*; *c*, the stem; *d*, the annulus or ring; *e*, the *volva*; *f*, patches of volva on the cap.

The principal terms that are used in describing the various parts of an agaric in detail follow:—

### *The cap or pileus*

The general contour of the cap, as shown in a section, is practically constant for each species, and is a point of great importance in determining species. When the pileus is practically flat it is described as *plane*; in Figs. 7 and 1 (Plate A) it is *convex*; in Fig. 3 (Plate A), the cap is described as *umbonate*; this term applies only to the central boss or *umbo*, and not to the general contour of the cap, which may be convex, depressed, etc. When the boss or umbo is very broad and flattish, as in Fig. 4 (Plate A), the cap is said to be *gibbous*. When there is a slight central depression the cap is said to be *umbilicate*, as in Fig. 13 (Plate A). In this case again, the general contour of the cap may be anything. If the central depression is deep and narrowed downwards to a point, the cap is *infundibuliform*, or *funnel-shaped*. When the cap shows parallel depressions from the edge for some distance towards the centre, it is said to be *striate*, as in Fig. 1 (Plate A). If the striations or grooves are coarse and deep, it is described as *grooved* or *fluted*. When no markings of any kind exist, the edge of the cap is described as *even*. The texture of the cap may be *scaly* or *silky*, self-explanatory terms, or it may be *smooth*, that is when the general surface is not broken up in any way into scales, silkiness, etc. This term applies entirely to the texture of the surface of the cap, and must not be confused with the term *even*, which applies to the absence of grooves, warts, etc. In some fungi the surface of the cap is more or less sticky, when it is termed *viscid*; sometimes the viscid substance is so abundant that it is inclined to drip from the cap; it is then said to be *glutinous*. In dry weather this gluten becomes quite dry, but a little experience in the field will soon enable the student to



recognize a cap that has been glutinous or viscid, by the shiny appearance of the cap due to the dried-up gluten, and by the fragments of grass, moss, leaves, etc., that are glued to the cap by the dried gluten.

*The gills or lamellæ*

Many important characters used in the determination of genera are derived from the relative mode of attachment of the gills to the stem, or their entire freedom from it. When the gill is attached or grown to the stem throughout its entire width, as in Fig. 3 (Plate A), it is described as *adnate*. When the gill is rounded off, so that it is attached to the stem by only about half its entire width, it is *adnexed*, as in Fig. 4 (Plate A). When the edge of the gill shows a more or less decided rounded indentation near the point of attachment to the stem, it is described as *sinuate*, as shown in Fig. 7 (Plate A). When the gill is attached to the stem throughout its entire width, and also runs down the stem for some distance as a gradually narrowing point, it is described as *decurrent* (Fig. 8, Plate A). Finally, when the gill is only attached to the cap, and rounds off before it reaches the stem, it is said to be *free*, as in Fig. 8 (Plate A). The above terms refer only to the relative attachment of the gills to the stem, or their entire freedom from it. It must not for a moment be supposed that in every fungus the characters defined above are as sharply marked as in the diagrams given. Sometimes they are, frequently not, but appear to be intermediate between one type and another. In such instances, other characters presented by the fungus in question will help to decide as to which of the two divisions, so far as the attachment of the gills is concerned, the fungus has to be placed under. When a gill is markedly broadest at the middle, in other words when the free edge or *margin* of the gill forms a segment of a circle, it is said to be *ventricose*, as in Fig. 7 (Plate A). The *anterior* portion of a gill is the part nearest to the edge of the cap; the *posterior* or *base* of the gill is that portion nearest to the stem.

Next we come to some terms which are purely relative, and can only be appreciated after the student has become familiar with a considerable number of species. Gills are said to be *distant*, that is distant from each other, when they are fairly wide apart; *crowded*, when they are fairly close to each other; qualifying terms also come in, such as *somewhat distant* or *somewhat crowded*. As there is no fixed point to start from, the student cannot possibly say, on examining his first fungus, whether the gills are in reality distant or crowded. The terms are really relative to what obtains in the particular genus to which the fungus under observation belongs. Gills that might with accuracy be described as crowded in one genus might with equal accuracy be described as somewhat distant if the fungus belong to another genus. The same remarks apply to the terms *narrow* gills and *broad* gills.

## PLATE B

1. *Rhizopogon rubescens*.
2. *Hydnangium carotæcolor*: The left-hand figure shows a basidium bearing two spores, the right-hand figure a basidium bearing four spores.
3. *Hymenogaster tener*: Section of entire fungus.
4. *Melanogaster broomeianus*: A basidium bearing four spores.
5. *Elaphomyces variegatus*.
6. *Cordyceps militaris*: Entire fungus growing on the chrysalis of an insect.
7. *Tuber melanosporum*: A single spore.
8. *Inocybe calospora*: A single spore.
9. Portion of a plant of "dry rot" (*Merulius lacrymans*).
10. *Tuber brumale*: A single spore.
11. *Inocybe bucknallii*: A basidium bearing four spores.
12. *Pachyphlæus melanoxanthus*: A single spore.
13. *Tuber æstivum*: A single spore.
14. *Balsamia platyspora*: An ascus containing eight spores.
15. *Tuber æstivum*: Fungus with a portion removed to show internal structure.
16. *Inocybe geophylla*: Section through a portion of a gill, showing, *a*, a basidium, bearing four spores; *b, b*, cystidia; *c, c*, paraphyses.



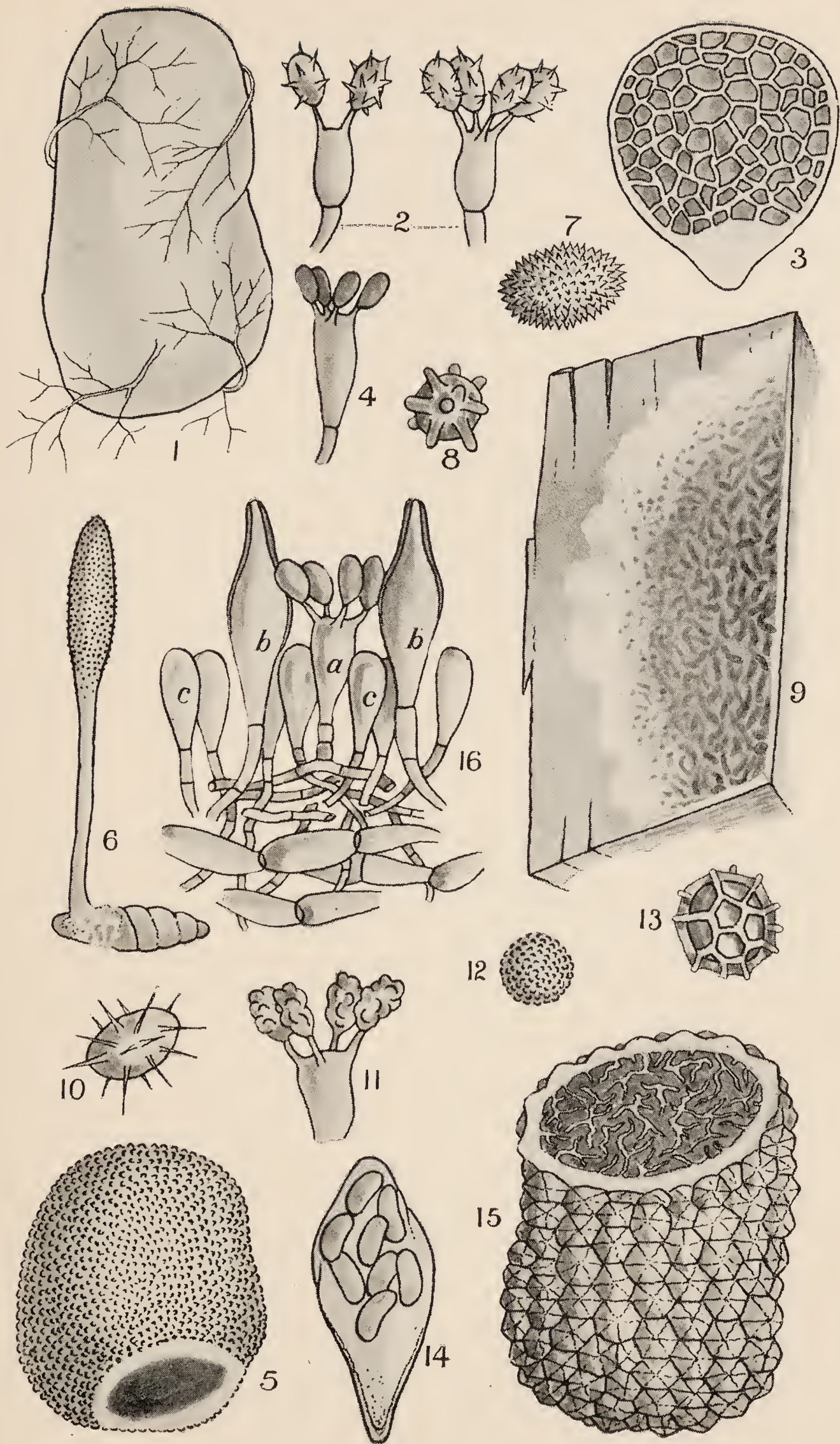


PLATE B



The *spores* or reproductive bodies in fungi, which are analogous with seeds in flowering plants, are produced on the gills. The entire surface of each side of a gill is covered by specialized cells, which collectively form the *hymenium* or spore-bearing surface. This can only be studied in detail when a very thin section of a gill is examined under the microscope, with a magnifying power of at least three hundred diameters. If such conditions are available, the middle portion of the section will be seen to consist of a mass of hyphæ running more or less parallel to each other, with numerous free ends curving outwards towards the surface of the gill, and ending at the surface of the gill in the various structures collectively constituting the hymenium. Fig. 16 (Plate B) shows all the various elements met with in the hymenium. The most essential are, *a*, a *basidium* (plural *basidia*), bearing the spores at its tip or *apex*. Intermixed with the basidia are numerous sterile, club-shaped cells, *c*, called *paraphyses*. In very many species of fungi basidia and paraphyses are the only organs present in the hymenium, whereas in the hymenium of other fungi, a third organ, consisting of large cells, projecting considerably above the general surface of the hymenium, are present, and are termed *cystidia*. These last-named structures are of great value in determining both genera and species, and it is a good rule to cut a section of the hymenium of every fungus examined for the purpose of determining their presence or absence.

### *Sporophore*

In some books the term *sporophore* is used. It means that portion of the fungus immediately bearing the hymenium. In an agaric, therefore, it would be the cap, from which the gills or hymenium-bearing surface springs. "*Hymenophore* distinct from the fleshy stem," means that the apex of the stem fits into the flesh of the cap somewhat like a socket; in other words, there is more or less of a line of demarcation where the flesh of the stem joins the flesh of the cap, although the two are grown together. When no such differentiation between the flesh of cap and stem is present, the "*hymenophore* is confluent with the flesh of the stem." These terms have been used as a basis for generic distinction, but are in reality valueless, as they are by no means constant. The differentiation between flesh of cap and stem is best seen in the Parasol mushroom (*Lepiota procera*), and this feature is sometimes given as one of the characters of the genus, but in many species this feature is absent, in fact, it is not obvious in more than about twenty British agarics.

### *Stem*

Most of the terms used in describing the stem, as *cylindrical*, *fusiform*, or *spindle-shaped*, are readily understood. As a rule the stem ends somewhat abruptly at the base; in some species, however,



the stem is prolonged downwards, when it is said to be *rooting*, or to have a *rooting base*. The texture of the surface of the stem is a point of importance. When it is rigid and somewhat polished it is described as *corticated*. When the surface shows an open texture, consisting of longitudinally arranged fibrils or strands, it is said to be fibrous. In many instances the lower portion of the stem appears to be surrounded by a sheath, which often reaches up to the ring, when it is said to be *peronate*. This sheath may be more or less scaly or hairy, or may appear like a smooth stocking. Finally, the stem may be *hollow*, *solid*, or *stuffed*, that is when the central portion contains a very loose, cottony substance

### *Ring or annulus*

When the secondary veil breaks away from the edge or margin of the cap, it forms a ring round the stem if its substance is sufficiently firm. In some instances the ring is fairly rigid, and it remains in an expanded condition, when it is described as *spreading*. When the substance is limp, it collapses more or less round the stem, when it is *drooping*. In a few instances the ring is *movable*, when it can be moved up and down the stem, as in the Parasol mushroom. The relative position of the ring on the stem is fairly constant, and is a point to be noticed. If quite near to the apex, it is *apical*; if situated about half-way down the stem, it is said to be *central*, or sometimes the term *distant* is used instead, meaning distant from the apex.

### *Volva*

When there is a free upper portion of the volva loosely surrounding the stem, it is said to be *sheathing*. When the entire substance of the volva is grown to the stem, or with the extreme edge only free, it is *adnate*. When there are only indistinct traces of a volva present on an agaric belonging to a genus, where a volva is normally present, it becomes *obsolete*, *partly obsolete*, etc.

## CHAPTER III

### THE CLASSIFICATION OF FUNGI

As would be expected, many different schemes have been devised for the classification of the fungi. Many of these are somewhat complicated, being replete with microscopic details, which, however important, could not be grasped by the beginner, and must be left until some progress has been made in the study. For the present an outline of the groups including the larger fungi dealt with in this volume alone will be submitted, and even in this case the primary divisions depend on microscopic characters. Fortunately, these microscopic characters coincide with very obvious structural features, which can be studied even in the field, or with the aid of a pocket lens at most.

### FUNGI

As a definition of the nature of fungi has already been attempted, a repetition is not necessary at this point, and the primary divisions will now be dealt with.

#### BASIDIOMYCETES

The one cardinal point in which thousands of different species of fungi, met with throughout the world, agree, is that the spores are borne *outside* the cell or basidium that bears them (Fig. 9, Plate A). They are, as already described, produced at the tip of a comparatively large cell, or basidium as it is called, and are usually four in number. So much for the microscopic character, which can be clearly seen if a thin section across the gill of any agaric is examined under a microscope having a magnifying power of about four hundred diameters. All the common toadstools or gill-bearing fungi belong here, also all the tube-bearing fungi, the bracket fungi, the club-shaped fungi; also the numerous crust-like patches of various colours that grow on dead trunks, bark, many of which are not much thicker in substance than a coat of paint on the wood. In addition to the foregoing, all the puffballs, stinkhorns, etc., and one group of the subterranean fungi, more or less resembling small potatoes, also belong to this group, which practically covers the greater part of the fungi described in this book.

We can now pass on to the second primary group of fungi touched upon in this volume.

## ASCOMYCETES

The one important feature in this group is that the spores are produced *within* a special cell called an ascus (Fig. 10, Plate A). This again is a microscopic character, which can be readily seen if a section through one of the cup-shaped species of *Peziza* is examined under a sufficiently high power of the microscope. The members generally constituting this group are not so familiar to most people as are those of the Basidiomycetes, one reason being that many thousands of species come under the category of microscopic species, the entire fungus not being larger than the head of a small pin. As a negative character it may be stated that none of the prominent structural features met with in the Basidiomycetes are repeated in the Ascomycetes. In the latter group the forms best known to people generally belong, broadly speaking, to the genus *Peziza*, cup- or saucer-shaped fungi, either *sessile*, that is stalkless, or with a more or less elongated stem, and then resembling a champagne glass. Large crimson and bright yellow species of *Peziza* are not uncommon on the ground in woods, etc. Another section includes the Morels and allied forms, which appear in the springtime. Finally, the underground true truffles are included in the Ascomycetes.

The remaining primary groups, Phycomycetes and Deuteromycetes, lie entirely outside our province.

The next point is to consider the primary divisions of the primary groups. The following two belong to the Basidiomycetes.

## HYMENOMYCETES

The principal feature of this group is that the hymenium is fully exposed from the first, or at all events before the spores are mature. In the numerous species growing as flat expansions on bark and wood, *Corticium*, etc., the hymenium covers the entire upper surface, and is fully exposed or unprotected from the moment of its first formation. The same is true of the various club-shaped or much branched fungi belonging to the Clavariaceæ, and also the bracket-shaped, woody forms, and tube-bearing fungi in general. In the toadstools or agarics, as the gill-bearing fungi are collectively called, in the great majority of species the gills bearing the hymenium are fully exposed from the earliest stage of development. In certain of the higher agarics and other groups a universal veil or a secondary veil is present, but these disappear and expose the hymenium at an early stage.

## GASTEROMYCETES

This, the second primary group of the Basidiomycetes, is diametrically opposed in its leading character to that of the Hymenomycetes, inasmuch as in the present group the hymenium is covered and protected until the spores are quite mature. To this



group belong the puffballs, where the whole of the hymenium or spore-bearing surface is enclosed in an unbroken wall, corresponding to the universal veil present in some agarics, until the spores are quite mature, when the surrounding wall, or *peridium* as it is called in this group, opens in some special way to admit of the escape into the air of the spores. The common stinkhorn also belongs to this group.

The two primary groups of the Basidiomycetes are, in turn, broken up into several distinct families, of which the following are included under the Hymenomycetes.

#### AGARICACEÆ

This family is characterized by the hymenium or spore-producing portion of the fungus being produced on gills or lamellæ. It is the most highly organized family included in the Hymenomycetes, whether viewed from the point of view of protection of the essential portion of the fungus, or from the standpoint of spore production and dispersion. The hymenium being formed under the shelter of the cap, which acts as an umbrella, protects the spores until ready for dispersion. The arrangement of the gills insures the production of the greatest number of spores with the least expenditure of material, and the small size of the spores insures their wide dispersion by wind and other agencies.

In the great majority of agarics the entire fungus rapidly decomposes and disappears, after the spores have been shed, and in all such the gill structure shows the highest phase of development to which the agarics have attained; that is, the plates or lamellæ are so arranged that the greatest possible number is packed in a comparatively small area, yet perfectly free from each other. In such genera as *Marasmius*, the entire consistency of the fungus is tougher, and does not perish so quickly, and the gills, instead of being quite free from each other, are connected by transverse ridges or veins, which just shadows in the porous nature of the hymenium characteristic of the next family, Polyporaceæ. Passing on to such genera as *Lentinus* and *Lenzites*, we find the substance of the fungus becoming corky and woody, and the gills so connected by transverse ridges as to appear as much porous as gill-like in structure; and if we take into consideration the fungi of the world at large, it becomes a matter of personal opinion as to whether such genera occupying the border-line, should be included in the Agaricaceæ or the Polyporaceæ, from which the first-named family probably evolved.

#### POLYPORACEÆ

The characteristic mark of this family consists in the porous nature of the hymenium, which in the most typical form suggests the idea that the entire surface had been perforated with pin-pricks closely crowded together. The little holes or pores are sometimes

circular, in other examples angular in outline. If a species of *Boletus* is examined, the hymenium, situated on the under surface of the cap, presents the pinhole appearance described above ; now if a median section is cut through the cap and down the middle of the stem, the true nature of the hymenium can be studied. It will be seen to consist of myriads of closely packed tubes standing end on, one end of each being attached to the cap, the other end forming part of the hymenium, and with its end open. It will be further observed that the general mass of tubes forming the hymenium can be easily separated from the flesh of the cap, and furthermore, that with a little care the component tubes can be separated from each other. Finally, the true hymenium or spore-bearing surface lines the tubes, the basidia with their spores projecting into the cavity. If a spore-print is made, by placing the surface of the hymenium of a *Boletus* on paper, and allowing it to remain until the spores have fallen, it will be seen that the little heaps of spores deposited on the paper will correspond exactly in shape and size with the pores in the hymenium of the specimen used.

The above explains the most typical structure of the hymenium met with in the Polyporaceæ, a word meaning literally many pores or small openings. As would be expected, there are many departures from the typical form. Nowhere else than in *Boletus* do the tubes separate readily from the flesh of the cap, neither can the individual tubes be separated from each other, yet the conception of tubes is dominant throughout the family. In species of *Boletus* the tubes are sometimes half to three-quarters of an inch long, whereas, taking the other extreme, as presented by the genus *Merulius*, of which *M. lacrymans*, or "dry rot," is perhaps the best-known representative, the tubes are exceedingly shallow, or practically non-existent, being reduced to very shallow pits, outlined by slightly raised ribs or veins, anastomosing to form an irregular network. Hence, whenever the surface of the hymenium presents a porous or pitted appearance, it is highly suggestive of the family Polyporaceæ.

To this family belong the hard, woody, bracket-fungi, many of which are perennial. There are great extremes of structure met with in the family, ranging from structures resembling an agaric, in having a fleshy cap supported on a central stem, and having the hymenium inferior, or situated on the under surface of the cap, to thin membranes spreading over bark or wood, and having the surface slightly pitted, resembling in appearance a long past attack of smallpox.

*Merulius* is the genus connecting *Polyporaceæ* with the next family Hydnaceæ, through the genus *Phlebia*.



## HYDNACEÆ

In this family the hymenium is spread over sharp-pointed or awl-shaped spines, which are closely packed side by side, on the under-side of the cap in the highest types, where, in some species, the spines are an inch in length. *Hydnum repandum*, a yellowish buff fungus, commonly picked up by the beginner for an agaric, clearly illustrates the structure typical of the family, having the under surface of the cap thickly studded with spines about a quarter inch in length, instead of gills as in an agaric.

The student will perhaps have begun to grasp the idea that in each family there is a gradual sequence of forms, from the most highly specialised representative to the most primitive one. Properly speaking, it should be said from the most primitive types to the highest ones, but as the complete forms most clearly illustrate the points most essential to a clear understanding of the classification adopted, I have preferred to commence with such. The student can readily reverse the order of things, when able to grasp the evolution of fungi generally.

As the grade of development decreases, we meet with representatives of the family with the cap growing out laterally, and without a stem, and a step lower are numerous forms which are merely thin, flat expansions growing on wood, having the entire upper surface covered with crowded, very short spines, which in some species are reduced to the most minute warts, visible under a pocket lens. Yet, wherever the surface of a patch of fungus shows a granulated surface, it suggests the family Hydnaceæ.

## THELEPHORACEÆ

This is a family of primitive forms, taking into consideration the gradual evolution of the hymenium or spore-bearing surface, as previously explained. In fact, the one feature stamping the present family is the perfectly smooth hymenium, as compared with a hymenium bearing spines, tubes, or gills, as in the preceding families. In some of the highest genera, as *Thelephora*, there are indications of wrinkles or warts on the hymenium, but they are sufficiently vague to allow of *Thelephora* being considered as more closely allied to the Thelephoraceæ than to the next family, Hydnaceæ. In many species of *Corticium* and allied genera, the entire substance of the fungus is thin, in many instances not much thicker than a coat of paint on the wood or bark on which they are growing. In such instances the hymenium appears warted or wrinkled, but this appearance is in reality due to the uneven nature of the substratum on which the fungus is growing, and not to any irregularity of the hymenium itself.

There is a great variety of form met with in the various genera, from the perfectly flat, thin films attached to the wood, as in

*Corticium*, to the erect, central-stemmed species of *Craterellus*, with a large, thin, deeply funnel-shaped cap, and having vague wrinkles or folds on the hymenium. In every instance the substance of the plant is quite thin, often rather leathery, sometimes more or less gelatinous, a feature by which the members of the present family are distinguished from those of the family *Clavariaceæ*.

#### CLAVARIACEÆ

This family agrees with the *Thelephoraceæ* in having a smooth hymenium, but differs very materially in the fleshy, club-shaped or much branched structure of the sporophore. The simplest forms are literally club-shaped, growing erect, and in some species reaching a length of six to nine inches, and a thickness of an inch at the widest part. There are gradations through several species until we arrive at some forms rarely more than one inch in height, and correspondingly thin. In some species that are usually simply club-shaped, we find a club bearing one or more short branches, whereas in other kinds, instead of a simple club, a densely branched tuft is produced, which in some species is three to five inches high, and forms very large tufts. In *Sparassis*, the most highly organized genus included in the family, the club idea is completely lost, and in its place we find a compact mass varying in size from a cricket-ball to that of a football, having the entire surface broken up into numerous, variously twisted, flat plates, anastomosing with or growing into each other. The flesh of the fungus is almost always brittle, as opposed to the members of the *Thelephoraceæ*, where it is tough and leathery. The colours are often clear and bright, yellow, orange, amethyst, red, etc. On the other hand, several species are pure white.

*Sparassis* is considered as a delicacy, and several other species are edible, and above the average. One small white species, growing in dense tufts among short grass (*C. vermicularis*), resembles "cheese-straws" almost exactly when cooked. None are known to be poisonous or in any way injurious when eaten.

#### TREMELLACEÆ

In this family the entire fungus is more or less gelatinous when moist, sometimes so much so that when picked up it almost loses its consistency, and is inclined to slip between the fingers. When allowed to dry the substance becomes rigid and horny, but regains its gelatinous nature when moistened. According to some authors, different and widely separated families are included under what is here considered as one family, the differences turning on the structure of the basidia. This, however, is too detailed for present consideration, and can be adopted or otherwise as the student advances in the study of the fungi. In the genus *Tremella* all the



species are very soft and gelatinous, and occurred as very much puckered or brain-like masses, growing out of dead wood, branches, etc. *T. mesenteria*, a bright orange, very much puckered mass, is by no means uncommon on damp, rotten branches, stumps, etc. In the genus *Auricularia*, on the other hand, the fungus has a distinctly marked sterile and fertile surface, the upper side being silky and coloured like that of some members of the Polyporaceæ, as *Polystictus*, the under surface bearing the hymenium being smooth, polished, and more or less covered with slightly raised ribs. The entire fungus is somewhat gelatinous when moist. In *Dacryomyces*, a very primitive genus, the species resemble minute orange masses of soft jelly (one or two lines across), oozing out of dead and waterlogged fir poles, boards, etc. During dry weather the fungus contracts, and is almost invisible.

In some species of *Tremella* dense grape-like clusters of conidia are produced in the tissue, either before or along with the proper spores, borne on basidia.

## ASCOMYCETES

As previously stated, the majority of species included in this division come under the category of microscopic fungi, being quite minute, and requiring microscopic investigation for the determination of both generic and specific characters, and as such, lie outside the scope of this book. On the other hand, some few members are fairly large in size, not uncommon, and certain to be met with during mycological rambles. Such are described, and in some instances figured, and mostly belong to the following families.

### HELVELLACEÆ

The ascophore in this family is always stalked, and in species of *Helvella*, commonly known as Morels, has the surface covered with deep, irregular pits. In others the ascophore is very irregular and wavy or saddle-shaped; in others, again, it is bell- or thimble-shaped, fitted loosely over the top of the stem. Morels appear in the spring; many are edible.

### PEZIZACEÆ

The members of this family are sometimes called cup fungi. The ascophore is at first globose, but gradually expands until it becomes cup-shaped or saucer-shaped, or in some instances it unrolls until it is almost flat. The part that is exposed during the expansion of the cup is called the *disc*, and is often very brightly coloured. A stem is present in some species, absent in others.

### SPHÆRIACEÆ

In the larger species with which we have to deal, numerous *perithecia* or fruits, containing asci, are immersed in a more or less



fleshy body, called a *stroma*. In the genus *Xylaria*, one species of which is often called the "candle-snuff fungus," the stroma grows erect, and is often more or less club-shaped, and might be mistaken for a *Clavaria* until carefully examined. A section across the fungus will reveal the presence of a row of minute, pear-shaped perithecia or ascus-producing bodies arranged round the periphery of the stroma. In the genus *Hypoxylon*, the stroma forms warts or crust-like patches on wood and bark. All the species are black in colour, and mostly hard or carbonaceous.

### HYPOCREACEÆ

The members of this family agree in general appearance, with those belonging to the Sphæriaceæ, some having an erect club-shaped stroma, others a flattened, crust-like expansion. The most obvious point of difference consists in the fact that the species belonging to the present family are never black, but often brightly coloured, and the general consistency of the fungus is soft and fleshy, not rigid and carbonaceous or brittle. Several of the species are parasitic on insects, more especially in the chrysalis or caterpillar stage.

Having given brief descriptions of the leading features of the principal groups of fungi, we are in a position to reduce such descriptions to the form of a key, just indicating the most constant and important structural characters of each family, and its subdivisions included in the Basidiomycetes. Some of the features are microscopic details, but it is hoped that such may be taken up, after the student has made a certain amount of progress.

### Order : BASIDIOMYCETES

#### Sub-Order : HYMENOMYCETES

Family : *Agaricaceæ*. Hymenium borne on lamellæ or gills.

Sub-Families : *Leucosporæ*. Spores white.

*Chlorosporæ*. Spores green.

*Rhodosporæ*. Spores pink.

*Ochrosporæ*. Spores ochraceous or brown.

*Melanosporæ*. Spores black or blackish purple.

Family : *Polyporaceæ*. Hymenium borne on the inside of tubes or pits.

Family : *Hydnaceæ*. Hymenium borne on the surface of spines or warts.

Family : *Thelephoraceæ*. Surface of hymenium smooth. Fungus incrusting, or when erect, tough and dry, or leathery.

Family : *Clavariaceæ*. Hymenium smooth. Fungus erect, club-shaped, or much branched, fleshy and brittle.

Family : *Tremellaceæ*. Hymenium smooth. Substance of fungus gelatinous when moist, rigid and horny when dry.

## Sub-Order : GASTEROMYCETES

- Family : *Hymenogastraceæ*. Subterranean ; more or less resembling tubers ; capillitium absent.
- Family : *Sclerodermaceæ*. Growing on the surface of the ground ; opening irregularly ; capillitium absent.
- Family : *Nidulariaceæ*. Developed above ground ; peridia containing *peridiola*, or little hard bodies resembling eggs in a nest.
- Family : *Lycoperdaceæ*. Developed above ground ; mass of spores powdery at maturity, and mixed with delicate threads forming a capillitium.
- Family : *Phalloidaceæ*. Developed underground, coming to the surface at maturity ; volva with a central thick, gelatinous stratum.

## Order : ASCOMYCETES

## Sub-Order : DISCOMYCETES

## Sub-Order : PYRENOAMYCETES

## CHAPTER IV

### HOW TO STUDY FUNGI

THE primary object of this book is to enable the reader to determine correctly the names of the different fungi met with growing in our woods and fields. As in most other instances, there is a wrong as well as a right way of doing this ; unfortunately, as a rule, perhaps without exception so far as my experience goes, the wrong way is the one that commends itself to beginners. What is the name of this fungus ? is the question invariably asked by a beginner, and it is a perfectly fair and natural question to ask, but unless the would-be mycologist is, by judicious management, led by degrees to find out names by a methodical process, the information gained will consist of a mere string of names, some wrong, and some right, but lacking any real knowledge of fungi.

In almost every instance the toadstools first appeal to the beginner, partly on account of their conspicuousness and frequent occurrence, and mostly because the student does not know of the existence of any other groups of fungi.

On turning to the chapter dealing with the Hymenomycetes or gill-bearing fungi, it will be found that they are divided into four primary, or principal groups, entirely depending on the colour of the mature spores (the spores of all toadstools or agarics are colourless when young). Consequently, the first thing is to determine the colour of the ripe spores. If the spores are persistently white or colourless when ripe, the fungus belongs to the group called *Leucosporeæ* ; if pinkish or salmon-colour, to the *Rhodosporeæ* ; if brown or iron-rust colour, to the *Ochrosporeæ* ; if purple-black or black, to the *Melanosporeæ*. It is the ripe spores that give the colour to the gills, hence the colour of the latter, when the fungus is mature, suggests the colour of the spores, and the primary group to which the fungus belongs. There are, however, pitfalls in this connection. In the white-spored group more especially, the gill substance, apart from the spores, often becomes yellow or grey when mature, or even from the earliest stage of growth. The colour is never so pronounced as to suggest any of the other groups, yet it is not absolutely white, although the spores may be colourless. Again, in the pink-spored group the gills remain for a long time practically white, and a pink-spored fungus thus might easily be



mistaken for a white-spored one. If such a fungus is kept until the following day, its true nature and position are revealed. As the student advances in the study, the difficulties connected with determining the colour of the spores will gradually disappear, as there are other characters, unwriteable certainly, yet nevertheless certain proofs that a given fungus belongs to the white-spored, pink-spored, brown-spored or black-spored group respectively.

It would be wise on the part of the student to prepare spore-prints of typical species representing the four colour-groups respectively. To do this, a mature agaric should have the stem cut off close to the gills, then place the cap, gills downwards, on a piece of paper, and cover the whole with a tumbler, basin, etc., to prevent undue evaporation. After an interval of eight to twelve hours, if the cap is carefully lifted up, a perfect impression of the interspaces between the gills will be formed on the paper by the deposited spores. If the spores are white, black paper should be used; if pink, brown, or black, use white paper.

After having determined the primary group to which the fungus belongs, the next step is to ascertain to what particular genus it belongs. To accomplish this object the key to the genera included in the group should be consulted, and it must be admitted that a little practice is required to become enabled to use a key properly, and benefit by it. After having settled the genus, last of all the species or name of the fungus remains to be determined. If the genus contains a considerable number of species, these will be found broken up into sections, and the first point is to determine to which section the fungus belongs. This once correctly determined, the identification of the fungus becomes a comparatively easy matter.

## CHAPTER V

### WHEN AND WHERE TO COLLECT FUNGI

FUNGI are present in abundance throughout the year, and are to be found everywhere, both out of doors and in the house. The occurrence of most of the larger fungi, mushrooms, toadstools, puffballs, etc., with which the majority of people are most familiar, during the autumn months, has led to the conclusion that autumn is the only season when fungi can be met with in abundance. This, as stated above, is true of the greater number of Agarics; hence fungus forays are held during that season, but the student who wishes to know something of the fungi as a group, and to become familiar with all the different families, must collect fungi all the year round.

During an ordinary season, damp, low-lying woods furnish the greatest number of species of Agarics, Clavarias, bracket-fungi, etc., but the ground must be fairly clear of dense undergrowth, bracken, etc. A favourite place for fungi is by the sides of paths or "rides" where the grass is short.

Mixed woods, that is woods containing trees of various kinds, generally furnish the greatest variety of species, but as the collector will learn by experience, certain species of fungi may be expected, more especially in woods containing in quantity one particular kind of tree. For instance, many kinds of fungi are rarely, if ever, found outside a wood consisting of conifers, whereas, on the other hand, many species of fungi never occur in pine woods. Many species of *Polyporus* or bracket-fungi only grow on certain kinds of trees, hence their possible presence is determined by the presence of the host.

Judging from my own experience, collecting is best done alone. Under those conditions you can do exactly what you please, and go where you like. Fungus forays, as a rule, are comparative failures, owing to having adopted the plan followed by most field clubs and so-called natural history rambles, where a cut-and-dried programme is given of the route to be taken each day. Such route is usually miles too long, if the locality is at all prolific, and it is certainly too long if the district proves to be sterile. The only thing to do under such circumstances is to take the law into your own hands, and do and go just where you please, even at



the risk of offending the powers that be. The larger fungi can be readily seen, but the numerous smaller fry require to be carefully looked for, and on coming to a promising place the only thing that ensures success is to settle down and work, as my old friend, Dr. M. C. Cooke, used to say, with a microscopic eye and serious intent. If the promising place happens to be an old half-decayed trunk, there is a chance of meeting with some of the minute species of Agarics or Pezizæ nestling amongst the moss, or inside the loose bark. As a rule, a superficial scan does not reveal the presence of



*Coprinus comatus* growing by the side of a path in the Queen's Cottage wood, Kew Gardens.

such minute species; the trunk must be carefully searched, a small portion at a time, and when a fungus is found, its superficial features, as seen under a pocket-lens, should be carefully noted down on the spot, as so many features that are quite obvious in the growing plant may disappear before it reaches home and is examined, perhaps the next day. Heaps of rotten branches in damp situations generally yield some very interesting species. The branches should be moved very gently, and not pulled out of the heap haphazard, otherwise any tender fungi present will be completely destroyed.

During exceptionally damp seasons, open pastures and lawns furnish many interesting species not met with in woods. Again,



heaps of dung in pastures furnish several species not met with elsewhere. Several very fine agarics belonging to the black-spored group occur on rather old heaps of horse-dung, while many minute but very beautiful fungi occur on old, half-dried patches of cow-dung. If a lump of horse-dung, not too fresh, is placed on a plate, covered with a bell-jar, and kept moist, a regular succession of species of fungi, extending over some months, can be obtained. First appears a cloud of the minute fungi, popularly known as moulds, which may number anything from one to ten different species, which as microscopic objects cannot be surpassed for beauty or variety of form, and small as the species are, it is not uncommon to find yet smaller species parasitic upon them, often climbing up the stems and branches after the manner of a honeysuckle twining round a branch. Within a week or two the moulds completely disappear, and may be followed by two or three dainty agarics, some not being more than one or two lines in diameter, growing in crannies and cracks, and which might escape attention unless specially looked for. Other fungi form more or less effused black crusts on the surface of the dung, and under a pocket-lens appear to be made up of minute black beads, closely packed side by side. These fungi produce their spores in asci, and if a single little bead is picked out on the point of a needle, crushed on a slip of glass and examined under the microscope, the asci, each containing eight coloured spores, can be readily seen.

An old, neglected wood-yard should never be passed, as many species of Agarics and Polypores, that usually grow high up and out of reach on trees, may often be secured.

Bogs, and especially sphagnum swamps, often furnish species that are not met with elsewhere, and some very beautiful fungi are sometimes to be met with on heaps of dead leaves or other vegetable refuse floating or stranded in ditches, bogs, etc.

Old decayed bodies of animals or birds are the home of certain fungi, and some of our rarest species, resembling miniature drum-sticks, grow on old bones, feathers, etc.

Coming to the truly parasitic species of fungi, which are mostly minute forms, perhaps the most conspicuous are the white mildews, often, unfortunately, so common on the leaves of cultivated plants. These fungi form snow-white patches on the leaves of living plants, as the hop mildew, rose mildew, etc. In these fungi the summer-fruit or conidia consists of large colourless cells powdered over the surface of the infected leaf; the winter or ascigerous fruit presents the appearance of very minute blackish dots scattered over the mycelium of the fungus, and are often very abundant. The large black blotches so common on sycamore and maple leaves, resembling patches of black paint, are certain to attract attention. This fungus is called *Rhytisma acerinum*. The "smuts" and "bunts" are also rendered conspicuous by the copious masses of



black, soot-like spores, often produced in the "ears" of oats, wheat, barley, etc. Some species belonging to the same group develop in the anthers of living plants. One such is common in the anthers of *Lychnis* and certain other plants belonging to the pink tribe—Caryophyllaceæ.

The rusts, forming rusty brown or blackish minute dots or streaks, are common on many of our cereals. The hollyhock rust, one of these, forming brown, hard, wart-like spots on living hollyhock leaves, is unfortunately too prevalent; it also occurs commonly on



*Psathyrella disseminata*, growing in dense clusters on stumps in the Rose Garden, Kew Gardens.

the leaves of our wild mallows. Its name is *Puccinia malvacearum*. All these forms of fungi should be collected and carefully dried and preserved, for, although not described in this book, the saying that "once a mycologist always a mycologist" is very generally true, and the possession of a collection when the student extends his study will be found most useful.

The above suggestions as to localities as to where fungi are likely to be found is by no means exhaustive. I have found many interesting microscopic forms on old deserted nests of wasps and bees. Finally, during one exceptional season, a fungus foray was held on New Year's Day, when over forty species of the larger fungi were collected.



## CHAPTER VI

### COLLECTING AND PRESERVING FUNGI

Two distinct ideas are involved in the collecting of fungi : (1) Collecting for the purpose of studying the specimens in a living condition and then discarding them ; (2) collecting specimens for the purpose of immediate study, and further, for preservation in a dried state for future reference. This latter method is, of course, most satisfactory, as notwithstanding the fact that in the case of soft, fleshy fungi many features are lost in the act of drying, yet, with experience, dried specimens, more especially those that have been examined by the student in a living condition previously, are of great value. On the other hand, numerous kinds of what may be termed dry fungi, that grow on dead wood, leaves, etc., are practically unchanged by the act of drying, and can be examined at any moment, and as the student advances in the study, and wishes to make a careful investigation of any special group of fungi, it will be found that the only possible way of so doing is by having access to a complete set of all the forms included in the said group. This can only be done by having a collection of carefully preserved specimens, for it must be ever borne in mind that however common and generally distributed any particular kind of fungus may be, it is not possible to go out and collect the given fungus at the particular moment it happens to be wanted, whereas if a specimen has been carefully dried and preserved, it is an easy matter to turn it up at any given moment.

In collecting fleshy fungi, agarics, etc., it is not sufficient to take hold of the stem and pull the plant up ; such attempts generally result in failure, as the plants are brittle and usually break. The fungus should be lifted out of the earth by means of an old knife, or even a pointed stick will answer the purpose ; for many years I used a walking-stick shod with iron for this purpose. In the case of those fungi having a volva or loose sheath surrounding the base of the stem, unless properly lifted out of the ground, the volva will almost certainly be left behind, and thus one of the most important characters of the specimen will be missing. In the act of collecting, the specimens should be handled as little as possible, as the stem more especially soon shows stains, and traces of the ring, veil, or delicate coating of mealy substance are apt to be



removed or obliterated. Do not collect more specimens than you can study in detail when you reach home. The mania for grasping at every fungus met with, and piling one on the top of another, only ends in disappointment, and perhaps disgust, as on unloading the collection, most of the specimens will be found to be crushed, broken, and generally useless. A vasculum, which serves well for the purpose of containing flowering plants, is useless for carrying fungi. The larger toadstools are best carried in an open basket, and should be kept separated from each other by a few springy fern fronds or similar material. Hard, woody fungi, such as species of *Polyporus* or bracket-fungi, should be placed at the bottom of the basket, and the delicate, gill-bearing species on the top, otherwise crushing will result. The smaller, delicate kinds of agarics should be placed separately in small boxes, and prevented from shaking about by moss, grass, etc. The tin boxes of various sizes, that originally contained tobacco, butter-scotch, cough-drops, etc., are admirable for the purpose, and should be commandeered whenever opportunity offers. Some of the boxes should be lined with cork, to which delicate specimens of moulds, myxogastres growing on bark, leaves, etc., can be firmly fixed by means of pins, as the slightest rubbing or contact with any substance ruins such specimens. For the removal of fungi growing on wood a stout knife is necessary; a pruning knife with a curved blade is excellent for the purpose.

In some instances I have found that nothing short of an axe is sufficient to remove some of the large, woody bracket-fungi from their support. The many mildews, cluster-cups, and other minute fungi that grow on living leaves, should be placed between the leaves of an old book to keep them flat, without applying much pressure, changing from time to time until the leaves are quite dry. The greatest difficulty is experienced in preserving the many small species of fungi that grow on naked earth. If the soil is moist and somewhat tenacious, a thin slice may be cut away and wrapped in paper. On arrival at home the soil should be soaked in a strong solution of hot gelatine until it is saturated. On cooling and drying, the gelatine will bind the soil into a compact mass that will not crumble. Care must be taken not to submerge the fungus on the surface of the soil in the gelatine. Finally, for purposes of microscopic study, specimens or portions of specimens should be preserved in spirit. Corked glass tubes are very convenient for this purpose. The specimens should be free from sand and dirt of every description. Good methylated spirit should be used.

The fleshy gill-bearing agarics are undoubtedly the most difficult to preserve in a dried condition for future reference, yet with a combination of perseverance and patience it can be done. As a preliminary to the preservation of a specimen, it is all essential that careful notes should be made of the most prominent features

present in the fresh specimen, and more especially those characters that cannot be expected to remain obvious in the dried specimen. Amongst such are the viscid nature of the cap or stem, the presence of a delicate bloom or mealy appearance of any part, colour, smell, taste, etc. These notes should accompany the specimen when dried, mounted on paper, and ready for the herbarium. One point of value in connection with such notes, is the fact that by experience a person is able to judge, with a fair amount of accuracy, the appearance of a living specimen from an examination of a dried one, as regards presence or absence of viscidness, texture, etc., if the changes undergone during drying have been carefully noted, and compared with the condition presented by the specimen in a living condition. Having accomplished the preliminary note-taking, it will be at once obvious that a large fleshy agaric cannot be preserved intact as a herbarium specimen, but must be manipulated in some way. As will have been already gathered, in all the gill-bearing fungi the mode of attachment of the gills to the stem, or their freedom from it, are points of primary importance in determining the genus to which a fungus belongs. This is accomplished by cutting a median longitudinal section or slice, about a quarter of an inch in thickness, through the cap and stem. This section will show clearly the relation of the gills to the stem, the outline of the cap, whether convex, depressed, etc., also the character of the margin or edge of the cap, whether incurved, recurved, or straight. As regards the stem, the section will indicate whether it was solid, hollow, or stuffed, that is, the central portion consisting of a loose, cottony substance. If a ring were present it will most likely break away during the process of cutting, but it should be preserved and placed in its proper position in the section. The same remark applies when a volva is present at the base of the stem. If specimens are plentiful, after selecting a typical one, the stem, gills, and portion of the flesh should be cut away, leaving the outside of the cap intact; this will serve to show the principal features of the cap, as to whether it was smooth, grooved, scaly, warted, etc. If only one specimen is forthcoming, then the pieces of the cap remaining after the central section has been removed, should be utilized. When the sections are prepared they should be placed between folds of botanical drying paper, or blotting-paper, and dried after the manner of drying flowering plants, but only very little pressure should be applied, and the paper should be replaced frequently by fresh dry sheets, until the specimens are perfectly dry. After the specimens have been drying for a few days, the amateur will often be disgusted to find that his specimens are teeming with small maggots, and more or less destroyed. The presence of various chemical forms of sugar existing in many fungi induces flies and other insects to deposit their eggs in the tissues of fungi, so that it is almost impossible to secure a fungus



free from maggots, a fact well known to those who have much to do with the common mushroom. To guard against this danger, the sections should be allowed to soak for say five minutes in methylated spirit. This treatment will kill any maggots present, but not the eggs that would hatch out during the process of drying, and if there is any indication of the presence of maggots during the time the sections are drying, they can be destroyed by applying a little methylated spirit with a brush. In addition to destroying maggots, methylated spirit, by abstracting water from the specimens, greatly facilitates the drying process, and my own practice has been to soak every—or almost every—specimen in spirit for a few minutes before commencing drying operations. After soaking in the spirit, an exposure to the air for say a quarter of an hour allows the spirit to evaporate, and the specimen is in every way better to manipulate. The same methylated spirit may be used over and over again, so the process is not expensive.

One thing I observe at this point, that I have previously forgotten, is, that the first thing to do with any specimen it is intended to dry for a permanent record is to obtain a spore-print, as previously described. This print should be fixed to the paper, along with notes, on which the specimen is mounted.

Many of the smaller agarics, and other fungi, can be placed in the press for drying in an entire condition, but in the case of gill-bearing fungi, a median section of the entire fungus is also desirable, for the reasons given above.

Numerous minute species of fungi that do not come within the scope of this book, will be encountered when collecting. It is strongly recommended that all such should be carefully preserved, full notes being made of the general characters presented when in the fresh condition, as it is almost certain that as the student makes headway with the study of mycology, every order of fungi will be studied. When such time arrives, the possession of well-preserved, dried material will be most acceptable, and it is only by collecting and preserving material when opportunity offers, that a fairly representative series of any one group of fungi can be got together. About a thousand different kinds of minute fungi, presenting to the naked eye the appearance of black dots or points, occur on dead wood, bark, herbaceous stems, leaves, etc., belonging to a family called Sphæriaceæ, and although to the naked eye, or even under a pocket-lens, the species bear a strong family likeness, yet when sections are made through these minute dots, and examined under the microscope, the great variety and beauty of the spores is something remarkable. Such sections can be mounted permanently on glass slips, and serve for all time when the species is once correctly named. When growing on leaves or other thin substances, the material can be dried after the manner of flowering plants. When growing on twigs or wood, thin pieces should be



shaved off. This is sometimes not an easy matter when the fungus is growing on the cut surface of an old trunk, or on a very hard piece of wood, but it must be remembered that a scrap, say one-quarter of an inch square, often bears scores of these tiny fungi, and with a certain amount of perseverance good specimens can be procured. One thing is of primary importance in connection with the collection of fungi growing on other plants, whether living or dead, and that is to make a note of the name of the plant on which the fungus is growing. The majority of fungi do not grow indiscriminately on every plant, but in a great many instances are met with on only one kind of plant, or on a few closely related plants. One advantage of knowing the name of the host-plant is, it may give the cue to the name of the fungus, when, as is usual nowadays, a list of the fungi with the host-plants they grow upon is given. A word of warning is necessary at this point; do not jump to the conclusion that your fungus is a particular species, just because your book states that that particular fungus grows on the kind of host-plant on which you have found *a* fungus. Microscopic examination can alone determine what the fungus really is. A second feature of importance in knowing correctly the host-plant on which a fungus is growing, is the gaining of a correct knowledge of the range of species, or the different hosts on which they can flourish. This is more especially important in the case of parasitic fungi that prove injurious to cultivated plants. As an illustration of this statement, it is well known that the fungus causing the dreaded potato disease (*Phytophthora infestans*) will also attack the tomato plant, hence it would not be advisable to plant tomatoes on land that had produced a diseased crop of potatoes. It is equally well known that the potato fungus will not infect wheat, or any other cereal, nor turnips, hence these crops might follow a diseased potato crop without any fear of infection.

To return for a moment to the subject of the matrix, that is the substance on which a fungus grows, it is also advisable to state the conditions under which the larger fungi are collected. Such notes as "on a rotten oak log," "in a sphagnum bog," "among pine needles," "among grass in a pasture," will be found eventually to possess value, although at the commencement of the study the value can hardly be realized or appreciated, and unless attention is called to the point, such information will undoubtedly be neglected at the commencement of the study, much to the disgust of the student at some later date.

When the specimens are perfectly dry and ready for putting away for future reference, a certain amount of method is necessary, so that any given specimen can be procured without loss of time. Perhaps the best method of dealing with the different species is to place each in a paper packet, the pattern of which is shown in the accompanying diagram. The name of the fungus, locality, sub-

stratum, or substance it was growing upon, and the date of collecting, should be written on the flap that folds down. The packets should be cut of various sizes to accommodate differently shaped specimens, and the paper should be rather stout. It is well to have stock patterns of a few of the most useful sizes of packets cut out of stiff paper, for the purpose of obtaining the outline on the paper used for making packets. By marking the outline of the pattern on the top sheet of a pile of paper, a number of packets

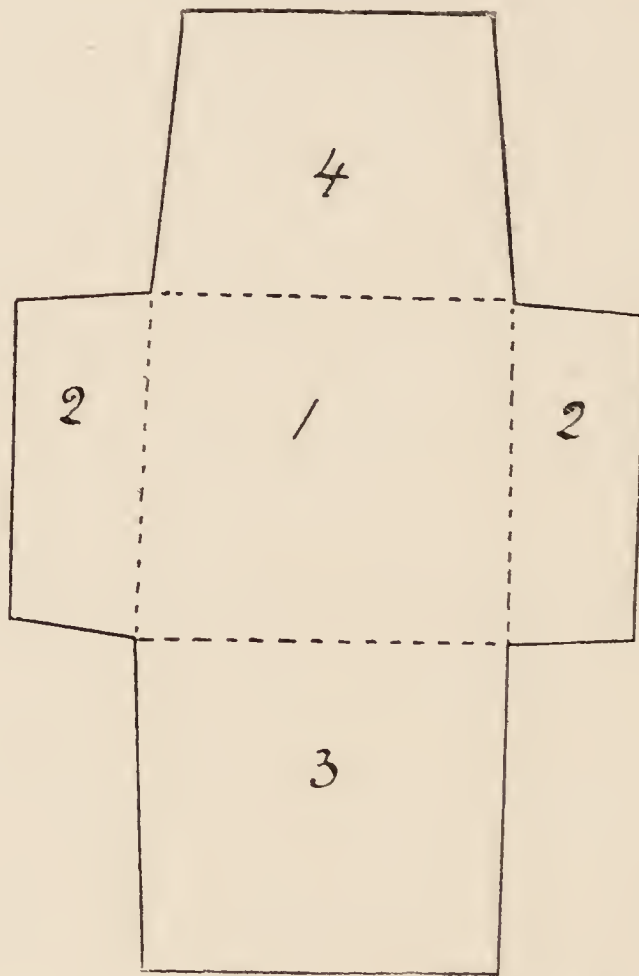


Diagram of a packet for containing a dried specimen. The specimen is placed on 1, then 2 2 are folded over the specimen in turn; fold 3 over 2 2, and finally fold 4 down over 3.

can be cut out at one time by means of a knife or scissors. When the specimens are deposited in packets, it remains to arrange them in such a manner that they can be found without trouble or loss of time. To secure this end each packet, with its contents, should be pasted or gummed on the back, and fixed to a sheet of paper of the size decided upon for the herbarium. I use foolscap size of fairly heavy quality. Never stick more than one species on the same sheet, which in the case of small specimens may perhaps take, say four packets of the same kind of fungus collected in different localities, and at different dates. The advantage of having several examples of the same fungus is, that each specimen frequently shows some particular feature better than any of the others. When



the specimens are large, perhaps two or three sheets may be required to accommodate the specimens. Do not fix the first packet in the centre of the sheet, technically called a "species sheet," but at one corner, and do not fix the packets on different sheets all at the corresponding corner, but vary the position, so that the sheet may be fairly flat when packed together. Write the name of the fungus on the lower right-hand corner of the sheet. There is a reason for this. Now suppose you have specimens of six different species belonging to the genus *Marasmius*, mounted on six separate species sheets, it is important that all the species should be kept together. This is done by enclosing the six sheets in a cover which should be a little larger than the species sheets, and a little thicker in substance. Now write the name of the genus in bold characters on the outside cover, at the lower left-hand corner. Now, when the various packets of genera in their folded "genus covers" are piled one on the top of another, the desired genus can readily be found by raising the left-hand corner of each packet until the desired one is met with. When found, the species contained within the genus cover can be ascertained by just turning over the right-hand corner of each species sheet in turn. This can be done by drawing out the genus cover for only a few inches, and not having to remove it entirely from the pile of genera, unless it contains the particular species desired. Naturally all the genera belonging to each of the families of fungi will be kept together; in fact, the arrangement of the herbarium should be that of the sequence of Orders and Families given in the chapter headed "The Classification of Fungi." The collection, at all events while small in bulk, may be kept in a box, drawer, or other convenient place where there is no fear of dampness. A small amount of camphor or naphthalene should be placed in each packet, and the collection should be periodically overhauled to see that mites, moths, or minute beetles are not feasting on the specimens.

Coloured sketches add greatly to the value of a collection, and this is especially true of the agarics or toadstools, where so much is lost, even when specimens are most carefully prepared. An ideal species sheet should carry one or more well-dried specimens, a good spore-print, a coloured sketch, and full notes.

The objection that a person cannot draw or paint is not a sufficient argument to prevent an attempt to do so. The production need not necessarily be a work of art, and yet, however crude, it conveys to the author, at all events, an idea of the original, and it is surprising how soon such attempts begin to take form, and prove to be of real value.



## CHAPTER VII

### ECOLOGY OF FUNGI

As previously stated in this book, probably more than once, the object is not merely to enable the student to ascertain the names of certain toadstools, but, having once learned the names purely as a matter of convenience, in enabling other persons to connect whatever observations you may make with a specific fungus ; the point is to endeavour to make observations of some kind, which, if accurately done, will be certain to add to our information respecting the why and wherefore of these interesting organisms. At this point the question naturally arises, What shall I do ? or, What can I do ? in this direction. Much depends on temperament, and on interpreting failures as simply indications that the line of work decided upon must be doggedly persevered in until light begins to dawn, after which progress is more rapid, and results commence to manifest themselves.

Some of the well-known points to be elucidated are as follows. Everyone who has studied fungi in the field for any length of time, knows that during certain seasons fungi belonging to one particular group are predominant ; whereas, in the same locality during other seasons, fungi of some other group are present in great abundance, and the members of the section that were in quantity the previous season are scarce, or practically absent. For instance, white-spored agarics may abound in one particular locality during one season, almost to the entire exclusion of brown or purple-spored kinds, whereas the following season the opposite may hold good for exactly the same district. Now if we attempt to sift the reason by the process of elimination, we are speedily forced to the conclusion that weather, in the broader sense, is not the cause, because in different districts very different results are met with. That is, in one district white-spored species will predominate, whereas in an adjoining district brown-spored forms are in the ascendency, at the same time and under practically similar climatic conditions. On the other hand, seasonal differences certainly do account, almost entirely, for the presence or absence of some groups of agarics. Certain pink-spored open pasture species belonging to *Leptonia*, *Nolanea*, etc., are never met with in abundance except following a

continuously moist, warm summer; nevertheless, when such conditions are forthcoming, our open pastures and moorlands are studded with some amongst the most beautiful of our agarics.

This suggests the question as to how those pasture-loving fungi tide over the time between one favourable season and another, the interval being often of many years' duration. The answer is not forthcoming at present. Do the spores remain in a dormant condition until a genial season arrives? Or do the spores germinate at once, and form a mycelium which possesses the power of remaining in a vegetative condition in the soil, obtaining its food from humus, etc., until conditions favour the development of a sporophore?

It has been suggested that the appearance of certain species is periodical and fixed, say at periods of three years, etc. Careful observations extending over several years, and conducted in different parts of the country, would test the value of this observation, and are certainly worth trying. The areas selected should preferably be located in mixed woods, where the different species of fungi occur in much greater abundance than in pure woods, or those consisting of one kind of tree only. There should be an absence of bracken, dogs' mercury, etc. Points that would have to be attended to are, the kinds of trees present, aspect of the area, amount of natural drainage, annual temperature and rainfall, amount of humus and nature of soil, and perhaps also the soil temperature. Work of this nature implies the co-operation of several independent workers. The greater the number the better the results.

The following idea may perhaps be worth considering, so far as the gill-bearing fungi are concerned. As the reader will learn, farther on in this book, the agarics or gill-bearing fungi are divided into four primary groups, depending on the colour of the mature spores (all spores are colourless when young). The most primitive group, in time, is black or purple-spored. From these evolved the brown-spored group, which in turn gave origin to the group having pink spores. From this group evolved the white-spored section, the most modern in point of time. Structurally, from the point of spore dispersion, and in many physiological features, as the presence of poisons, alkaloids, etc., there is a gradual sequence of development, from the black-spored group to that producing white spores.

It is a fact well known to growers of mushrooms, that the beds are often overrun by other worthless kinds of fungi, but in every instance the intruders have been higher in the sequence of evolution than the dark-spored mushroom group. In other words, the stray mushrooms infesting the mushroom beds always have pink or white spores. It is well known that the roots of certain flowering plants give off substances inimical to other plants, which consequently cannot grow in their neighbourhood. My observations lead me to believe that in a similar manner the mycelium of one fungus can

destroy, or at all events prevent the development of another kind of fungus, and further that the mycelium of a white-spored fungus is more potent in this respect than the mycelium belonging to a fungus belonging to any other group. Next in power come the pink-spored section, followed by the brown-spored, and finally the black-spored group, which, if this idea is correct, are limited in their choice of ground to those places not previously occupied by any of the other groups. Carefully conducted experiments alone can decide this point.



## CHAPTER VIII

### EDIBLE AND POISONOUS FUNGI

THE edible properties of certain fungi is not a modern discovery. The subject is alluded to in many of the most ancient records known. The ancient Greeks were experts in the discrimination of edible species. The custom, too, is cosmopolitan, both civilised and savage nations throughout the world indulge in the pleasure of eating fungi, or in other words, are mycophagists.

It may be well to state emphatically, and at once, that the various rule-of-thumb methods, sometimes followed by very unpleasant, if not fatal results, for the certain discrimination between edible and poisonous kinds of fungi are absolutely valueless. Among such may be mentioned the old statement that all fungi having a skin that can be peeled off the cap, as in the common mushroom, are edible. This statement is not correct. Again, it is said that if a silver spoon, placed along with the fungi when cooking, turns black, it is a sign that such fungi are poisonous. This again is not correct. Dr. Cooke's dictum on this point is as follows: Eat them; if you live they are edible; if you die they are poisonous. This, however, is not practicable, hence the only reliable advice that can be given is: learn to know fungi correctly by their proper characters, in the same way that you recognize flowering plants, and do not attempt to eat fungi until you are quite certain you know them correctly. The help of a more experienced person is of great value on such occasions.

The very common opinion that there is but one edible fungus, the common mushroom, or *Agaricus campestris*, and that all others are toadstools, and consequently poisonous, is a mistake. In fact, there are probably a much greater number of edible fungi growing in this country than there are truly poisonous ones. The greater number of fungi are what may be termed neutral, that is, they are not poisonous, but for one reason or another are not edible, either on account of their woody or leathery consistency, absence of all aroma and flavour, or on account of their diminutive size. There are at least fifty kinds of fungi, many of which are fairly abundant in our woods and fields, that are not only perfectly safe to eat, but at the same time are worth eating, on account of the decided

pleasant taste and aroma they possess. This number is scattered throughout various families of fungi, and all do not by any means possess gills, or conform to the mushroom type of structure. At this point, I again repeat my previous warning, do not risk anything in the way of eating fungi until you are quite certain as to their identity. They are not worth the risk. At one time it was stated, based on chemical analysis, that fungi contained more nitrogenous material than beef, and, consequently, were more nutritious. Chemical analysis, as conducted to-day, does not disprove the older statement as to the amount of nitrogenous material present in the tissues of fungi considered edible, but it has pointed out that the



*Boletus scaber*, an edible fungus, that has been partly eaten by a squirrel.

amount of nitrogenous material present that can be assimilated, or used as food, is very small indeed, and that fungi practically contain no more flesh-forming material than a cabbage does, which is about the smallest amount that can be obtained from anything we eat. Notwithstanding this, fungi have their special flavours, often combined with a very pleasant aroma, and in this way serve a purpose; because it must be remembered that we do not gain actual flesh and blood from everything we eat, as examples, salt, mustard, spices, etc., but these substances, due to custom, render more palatable those kinds of food essentially necessary to our well-being, and also, in some instances, aid digestion and the assimilation of the nutritious portion of the food we eat.

The following table, showing the relative values of beef and the



common mushroom, is abridged from a fuller comparative table in Professor Atkinson's excellent book on *American Mushrooms Edible and Poisonous, etc.*

|                            | Proteids. | Fats. | Carbo-<br>hydrates. | Calories. | Cost:   |
|----------------------------|-----------|-------|---------------------|-----------|---------|
| Beef (round) ..            | 1.87      | .88   | —                   | 7200      | \$ 1.50 |
| <i>Agaricus campestris</i> | .18       | .03   | .46                 | 1316      | 2.50    |
| Cabbage .. ..              | .18       | .03   | .49                 | 1400      | .15     |

It is somewhat remarkable, and at the same time unfortunate, that in several instances a really good and safe edible fungus agrees more or less superficially with an objectionable or sometimes truly poisonous fungus. There are certainly, in all cases, clearly marked botanical differences between the two, but such differences are apt to be overlooked or wrongly interpreted by the beginner, therefore those desirous of eating fungi other than the common mushroom will act wisely in not attempting at first to discriminate between species bearing a superficial resemblance to each other, when food, or what is often termed the "pot," is the primary object. Start with a few well-marked species having no poisonous doubles, as represented by the following, which I think, by the combined aid of the figures and the descriptions, cannot be confounded with any other species.

*Agaricus campestris*, the common mushroom (Plate XXIV, Fig. 10); *Lepiota procera*, the parasol mushroom (Plate IV, Fig. 1); *Coprinus comatus* (Plate XXIV, Fig. 3); *Fistulina hepatica*, the beefsteak fungus (Plate XXIV, Fig. 11); *Hydnum repandum* (Plate XXVII, Fig. 7); *Boletus scaber* (Plate XXVII, Fig. 4). Full details as to the various methods of cooking fungi, making ketchup, etc., are contained in Dr. M. C. Cooke's *British Edible Fungi*. In this book is a list of 194 British species, said to be edible by different authorities. Many of these, however, are rare, others too small to count as edible fungi, in the sense of ever procuring a sufficient quantity to constitute a dish. Of this number, Dr. Cooke has personally partaken of sixty-nine different kinds in sufficient quantity to guarantee their harmlessness at all events. As would naturally be expected, some kinds appealed to him more than others.

Turning to truly poisonous fungi, it may be stated without fear of contradiction that one species, *Amanita phalloides* (Plate II, Fig. 1), is responsible for 90 per cent of the deaths actually due to poisoning by fungi, not only in this country, but also throughout Europe and the United States. This is one of our commonest of fungi in woods, very neat and harmless-looking, taste and smell pleasant, but withal deadly in its action. Two other very closely allied species, *Amanita mappa* and *A. pantherina*, are almost equally poisonous, while, curiously enough, a fourth closely



allied species, *A. rubescens*, is one of the most dainty of our edible fungi. Finally, yet another species of the same genus, *Amanita muscaria* (Plate II, Fig. 5) is poisonous. This is perhaps our most conspicuous of toadstools, with its bright crimson cap studded with white patches. Several other species are poisonous, many of the pink-spored species are suspected.

## CHAPTER IX

### DISEASES CAUSED BY FUNGI

BOTH animals and plants suffer from the attacks of fungi, and some fungi are also attacked by other kinds of their own class. The higher plants suffer most, and it is certain that every flowering plant has one or more kinds of fungi that look upon it as their legitimate prey. Even the seaweeds do not escape. Many of the most destructive fungus parasites are of microscopic dimensions, as the numerous rusts and smuts so destructive to cereals and other plants, and the majority of the blotches and spots on leaves and fruit are caused by parasitic fungi. On the other hand, the large bracket-shaped or hoof-shaped woody fungi growing on the trunks of living trees are injurious parasites.

It has been estimated that the annual loss on cultivated plants throughout the world, due to the ravages of fungi, amounts to at least £2,000,000,000. As examples of specific cases, the coffee-leaf disease in Ceylon caused a total loss amounting to £17,000,000. An estimate by the Prussian Statistics Bureau gives the loss on cereals in that country from rust alone, in one year, as £20,000,000. In the United States the annual loss on apples from bitter-rot is estimated at £2,500,000. Numerous other examples could be furnished. In this country no official estimate of the annual loss caused by fungi is made, but it is perfectly certain that such loss amounts to an enormous sum.

The above accounts refer to diseases which, owing to exceptional climatic or other conditions, enable the disease to become of the nature of an epidemic, but even in those years when epidemics are absent, fungi are invariably at work, and causing more or less loss.

It is an established fact that parasitism in fungi is an acquired habit. Some of the reasons for this statement are as follows: Throughout the fungi every grade of parasitism may be observed, from the incipient stage where the fungus, as it may be stated, lacking experience, kills its host-plant within a very short period of time, thus limiting its own period of existence to a matter of days, or in some instances, even of hours. To this category belongs the minute fungus (*Pythium*) causing "damping-off" in seed-beds, where the tiny seedlings are attacked, fall over, and die within a few hours.

Such fungi are a source of great trouble to the gardener who selects damp, stuffy, badly lighted places for his seed-beds, whereas when open well-ventilated localities are selected, the fungus is held in check. Many kinds of fungi that attack living leaves, forming coloured patches or brownish spots, and causing the premature fall of the leaf, are also short-lived. This, however, is not always the case. The large black patches resembling blotches of



“Smutted” oats, caused by a fungus called *Ustilago avenæ*.

gas-tar, so common on the living leaves of the sycamore and the maple, called *Rhytisma acerinum*, attacks the leaves soon after they are fully grown, and causes them to fall prematurely. During the summer the fungus forms a conidial condition of fruit, and continues to grow on the fallen dead leaves throughout the winter, producing a second and higher form of fruit the following spring, just at the time when the sycamore leaves have expanded. These young leaves become infected by the spores of the fungus formed



during the winter on the dead, fallen leaves, and the fungus thus continues its annual cycle of development.

In this instance the course of the fungus can be arrested by clearing away and burning all fallen infected leaves before the spores are liberated and dispersed by wind, animals, insects, etc., in the spring.

Going to the other extreme, where the parasite has evolved the method of living along with its host-plant without causing injury, but, on the other hand, actually enabling the host-plant to grow more vigorously than plants of the same kind not infested with a



“Smutted” wheat, caused by a fungus called *Ustilago tritici*.

parasite, and to pass uninterruptedly throughout its normal period of growth, illustrates a much more highly developed phase of parasitism than is manifested by the “damping-off” fungus described above. Even in this advanced phase of parasitism, marked differences of degree are observable. *Ustilago avenæ*, the fungus causing the soot-like “smut” in the ear of the cultivated oat plant; the spores of the fungus, present in the soil, infect the seedling oat plant when it is only a few days old, in fact it is only during the seedling stage that the plant can be infected. After infection the mycelium of the fungus grows up along with the oat plant, embedded in its tissues, and without any external evidence of its presence, until the ear is formed, when the mycelium passes

into the flower, and produces the black powdery mass of spores known to farmers as "smut," which takes the place of a grain of oats which under normal conditions would have been present. The spores or "smut" when ripe are washed by rain or blown by wind on to the ground, where they remain, and in due course infect a succeeding crop of oats. Now, in this instance the fungus practically lives actively as long as its host-plant does, and only produces spores to tide it over that period of time when its host-plant, being an annual, is not present. The points to notice in



Leaves of plum tree destroyed by a fungus called  
*Hormodendron hordei*.

connection with this parasite are as follows: It causes no injury to the host-plant during the period of vegetative growth of the latter, but when the oat plant commences to form its seed, the fungus steps in and prevents this operation by usurping the position that the oat grain would have occupied under normal conditions, thus an oat plant that is infected is prevented from reproducing its kind by means of seed. To this extent the oat plant suffers, due to the presence of the parasite. The parasite, on the other hand, has not advanced beyond the stage of having to produce spores for the purpose of perpetuating its kind from year to year. The question, Why not? will probably suggest itself. Is it not the



natural thing for a fungus to perpetuate its kind by means of spores? Certainly so, on the part of those fungi which, up to the present, have not learned to economize, and perpetuate themselves without troubling about spores. The general progress made by fungi in parasitism may be estimated by the relative extent to which they have reached in being able to perpetuate themselves from year to year, or in time, without the intervention of spores. In other words, the more expert a fungus becomes in the art of parasitism, the less it is dependent on spores for its perpetuation, and in the most perfect examples of parasitic fungi known, conidia and spores alike are entirely dispensed with.

The fungus causing the dreaded potato disease (*Phytophthora infestans*) illustrates this point to a certain degree. There are several species of *Phytophthora* known, and all are destructive parasites; some, as the kind under consideration, causing serious injury to cultivated crops of various kinds. Normally these fungi have the two forms of reproduction, conidia or summer-spores, and resting-spores or winter-spores, which require a period of rest before they germinate, which takes place during the season following their production. It is these winter-spores that first infect the crop, the spread of the fungus throughout the season being carried on by the summer-spores, which are produced in abundance and in rapid succession, are dispersed by wind, animals, etc., and are capable of germination the moment they are mature. Now in the potato *Phytophthora* only one form of reproduction remains, namely the conidia or summer-spores, the winter-spore stage being completely arrested. As previously stated, it is the function of the winter-spores to set up the first infection of the host-plant each season, and as this stage is missing in the potato fungus, unless some other provision existed for its continuance from year to year, the fungus would entirely disappear. Such provision is present under the form of what has been called hibernating mycelium, that is mycelium of the fungus which remains in the tubers of the potato, and which grows up from the tuber into the stem and leaves when an infected tuber is planted. This condition of things comes about as follows. Suppose we commence with a perfectly healthy potato plant, and infect the leaves with the conidia or summer-spores of the potato fungus. The first indication that the conidia have germinated and entered the tissues of a leaf is the appearance of a blackish patch on both surfaces of the leaf. The time of its first appearance depends to a considerable extent on weather conditions. If the weather is dull, damp, and warm, the patch may appear three or four days after infection. If the weather is bright and dry, probably no infection will take place. Granted that the plant has been infected, the blackish patches on the leaves quickly increase in size and present a water-logged appearance, and around the edges of the blotches a very delicate white mildew appears. This



is the conidial or summer-fruit which is produced on the surface of the leaf, so that the conidia may be dispersed and infect neighbouring plants.

At the same time that the fungus is producing its summer-fruit on the surface of the leaves, its mycelium grows down the inside of the stem, passes along the inside of the underground branches, and finally enters the tissues of the young potatoes or tubers. When tubers containing such hibernating mycelium are planted, the mycelium grows up along with the stem, enters the leaves, and in



“Witches'-broom” from an alder tree, produced by a fungus called *Exoascus turgidus*.

due course produces summer-spores ; some of the mycelium also passes along the underground branches and enters the new tubers, which thus become infected, and in turn produce another diseased crop when planted. As a rule, tubers containing mycelium can be recognized by the presence of brownish patches on the surface, or in the substance of the flesh, but this is not always the case, and the mycelium may be present without any obvious discoloration of the tuber. This accounts for many outbreaks of potato disease when tubers apparently sound were planted, and when no disease was present in the district that could furnish summer-spores for infection. It may naturally be asked, If tubers

containing hibernating mycelium, capable of producing a diseased crop, are so prevalent, how is it that so many crops entirely escape the disease? The reason for this is that the absence of disease in a crop depends almost entirely on weather conditions, even when the tubers planted are known to be diseased.

The following experiment, conducted at Kew, illustrates this point. A number of potatoes showing marked evidence of the disease were each cut into two equal parts. The half potatoes were planted separately in plant-pots. Half the number of pots were placed in a forcing pit having a high temperature, and a constant



Pear scab, forming blackish blotches, and causing the flesh to crack. Caused by a fungus known as *Fusicladium pyri*.

supply of moisture in the air. The remaining pots were placed in a house having a lower temperature and exceptionally dry air. Within a few weeks after the shoots appeared above-ground, all the plants grown in the house having a high temperature and air saturated with moisture were completely destroyed by the disease. The plants grown in the cooler house having drier air remained perfectly healthy. At this stage half the number of healthy plants grown in the cool house were placed in the hot, damp house, where within a short time they were killed by the disease. Those plants that remained in the cool, dry house during the entire period of their growth remained perfectly free from disease, and yielded a good crop of potatoes.



The above experiment proves that even when the germs of a disease are present, their further development depends to a very great extent on the conditions under which the host-plant is placed. This is a point perfectly well known to the growers of potatoes, although unfortunately they are unable to modify the conditions. The occurrence of a few cloudy, damp, warm days spells potato disease to the farmer, such conditions being unfavourable for the growth of the potato plant, but highly favourable for the parasite in its tissues. In all probability external conditions determine, to a far greater extent than we at present recognize, matters relating to health or disease in plants. The same is true of the animal kingdom. A person tainted with pulmonary trouble, by living in a dry, bracing climate, can hold the disease in check, whereas if living in a damp climate the disease usually predominates.

To return to the progress made in the art of parasitism by the potato fungus. From the above account it will be seen that the higher, sexual, or winter-spore stage has completely dropped out, its function of continuing the species from year to year being replaced by the development of permanent or hibernating mycelium in the tubers of the host-plant. The conidial or summer-spore form of fruit has been retained, by which means it is enabled to extend its geographical area. Thus there are two distinct methods by which the potato disease fungus can be spread. (1) By planting tubers containing the mycelium of the fungus, in a district previously free from disease. By this method the potato disease has been spread in a wholesale manner, and it is now present in every part of the world where the potato is cultivated. (2) By means of summer-spores, which are dispersed by various agents, and continually infect plants previously free from disease.

A yet more highly developed type of parasitism, where the health of the host-plant is not in any way interfered with, and where spore formation of every kind has been dispensed with, the only method of propagation being assured by hibernating or perennial mycelium is met with in the fungus parasitic in the grain of certain kinds of rye-grass, as *Lolium perenne*, *L. temulentum* and *L. italicum*. The mycelium of the fungus is present in the "seed" or grain. On the germination of the grain the mycelium assumes active growth, and keeps pace with the growing stem of the grass, living in the tissues, and continues to do so until it enters the new seed, where it remains along with the seed, in a resting condition until the seed commences to germinate, when the same cycle of growth is repeated. The presence of the fungus in the tissues during growth in no way interferes with the functions of the host-plant; in fact, it has been proved that infected plants are more vigorous and robust than uninfected plants. So complete is the mutualism between host-plant and fungus, and so certain is the latter of perpetuating itself by mycelium, that the production of spores or fruit of any kind has been arrested,



hence we have no means of determining the nature or affinities of the fungus, and as a consequence no infection of other rye plants can take place, and the distributional area of the fungus will in future be determined by the distribution of infected host-plants. We have now existing two races of each of the three rye-grasses mentioned above. One race infected, and always producing in-



Base of a larch seedling attacked by the fungus called *Armillaria mellea*. The bark is cut away to show the white sheets of mycelium running up inside the bark.

fectured seed. A second race free from infection, and without the possibility of becoming infected. Microscopic examination of commercial samples of the seed of *L. temulentum* or darnel showed that over 80 per cent contained the mycelium of the fungus, hence the facility for a world-wide dispersion of diseased darnel, rye-grass, and Italian rye-grass.

A second proof that parasitism is an acquired habit is afforded

by the numerous kinds of fungi known as wound-parasites, that is, fungi that are incapable of directly infecting a living host-plant through an unbroken surface, but which, when placed on a wounded portion of the host, first live on the injured tissue, and gradually pass on to the living tissues, and act in every way as true parasites. To this class belong most of the large, woody bracket-fungi (*Polyporus* and *Fomes*), commonly met with on the trunks of living trees, also the beefsteak fungus (*Fistulina*), and many agarics. The wound-parasites gradually pass into another group of fungi that may be termed occasional parasites, that is, fungi which, as opportunity offers, can live as either saprophytes or parasites. These fungi are numerous and but little understood in their relation to saprophytism or parasitism, and every now and again for some unexplained reason become rampant parasites, and occasion serious loss if the hosts happen to be cultivated plants.

A third proof that fungi have become parasites by steps as it were, is the fact that fungi known only as saprophytes can be educated to become rampant parasites, by sowing the spores on a living host-plant, to which is added some of the sap of the saprophytic material on which the fungus normally grows. When this method is repeated several times, always using the spores of the preceding generation, the fungus gradually acquires a new taste, and in course of time the spores will germinate and attack the new host-plant without the assistance of any of the food-material that it required as a saprophyte. Hence it would appear that in many instances the habit of parasitism is the outcome of circumstances. The spores of a saprophytic fungus happen to be blown on the wounded portion of a living plant. The spores germinate on the dead tissue of the wounded portion, and gradually pass on into the living portion. By such means we get strains of fungi; one specimen happens, through a mere accident, to gain access through a wound to living tissue, and acquires the habit of parasitism, which is inherited by its offspring. Another individual of the same species, lacking opportunity, remains a pure saprophyte.

Parasitism has been reduced to a fine art in many of the most advanced groups of parasitic fungi, as the rusts of cereals. Here we have what have been termed "biologic species," that is, species which possess no structural or morphological differences, one from another, but which can be readily recognized by biological properties. Such biologic species originated from a common species or ancestor, whose structural peculiarities they retain, but certain members have become so specialized that, as parasites, they can only infect and live upon a single kind of host-plant. Another lot of the same species in like manner has become so highly specialized that it can also only infect one special species of host-plant, and so on. Thus biologic species simply signify so many forms belonging to a common species that have struck out a line for themselves,



and at the present day have become so highly specialized that they are bound down for their existence to the presence of a single kind of host-plant.

In addition to victimizing plants, fungi are also parasitic on members of the animal kingdom, insects perhaps being the greatest sufferers, myriads of insects being destroyed annually by parasitic fungi. The white halo that surrounds a dead fly on a window-pane is a fungus. Most insects are infected by spores while alive. The spores germinate and form a mycelium which slowly kills the



*Cordyceps*, a parasite fungus growing on a caterpillar.

insect. At a later stage the fungus produces its fruit on the surface of the body of its victim. The fungus fruit often assumes the form of a club ; a common and beautiful club-shaped fungus, one to two inches high, and of a beautiful orange-red colour, is not uncommon, apparently growing out of moss or amongst dead leaves. If the fungus is removed very carefully it will be found attached to the chrysalis of an insect. In New Zealand, many of the huge caterpillars that abound there are attacked by fungi, the mycelium of which gradually completely fills the body of the caterpillar, and forms a dense, white, woody mass. The clubs that spring from these caterpillars are sometimes six inches in length.



## CHAPTER X

### LUMINOSITY OF FUNGI

SEVERAL species of fungi emit a bright phosphorescent, greenish light during the night, or when kept in darkness. This is more frequent in exotic than in British species. Sterile mycelium in decayed wood, rhizomorphs and sclerotia also possess the same property. *Corticium cæruleum*, an indigo-blue fungus forming a thin, satiny film on old bark, wood, etc., is perhaps our best example of a phosphorescent fungus, but examples of such mycelium and fungi are not uncommon on woodwork in mines. The following account by Berkeley gives a vivid idea of what the mycelium of a fungus is capable of doing in this direction. "A quantity of wood had been purchased in a neighbouring parish, which was dragged up a very steep hill to its destination. Amongst it was a log of larch or spruce, it is not quite certain which, twenty-four feet long and a foot in diameter. Some young friends happened to pass up the hill at night, and were surprised to find the road scattered with luminous patches, which, when more closely examined, proved to be portions of bark or little fragments of wood. Following the track, they came to a blaze of white light which was perfectly surprising. On examination it appeared that the whole of the inside of the bark of the log was covered with a white byssoid mycelium of a peculiarly strong smell, but unfortunately in such a state that the perfect form could not be ascertained. This was luminous, but the light was by no means so bright as those parts of the wood where the spawn had penetrated more deeply, and where it was so intense that the roughest treatment scarcely seemed to check it. If any attempt was made to rub off the luminous matter it only shone the more brightly, and when wrapped up in five folds of paper the light penetrated through all the folds as brightly as if the specimen was exposed. When, again, the specimens were placed in the pocket, the pocket when opened was a mass of light. The luminosity had now been going on for three days."

A satisfactory explanation of the phenomenon is not forthcoming. The light is brightest in those portions of an agaric where growth is most vigorous

## CHAPTER XI

### FOSSIL FUNGI

SOME of the primitive forms of fungi are geologically of great antiquity, having been found in the tissues of plants from the Lower Carboniferous and Permian rocks. Members of the Agaricaceæ and the Polyporaceæ have been found in Tertiary formations.

Altogether, just over four hundred species of fossil fungi have been described and figured.

## PART II

### Family AGARICACEÆ

#### Sub-Family LEUCOSPORÆ

##### I.—*Haplophyllæ*

Edge of gills sharp ; i.e. not longitudinally split or grooved.

\* MOLLES.—More or less fleshy, soft and soon decaying or shrivelling (not corky, woody, nor rigid).

† *Ring, or volva, or both present, or gills free.*

Volva and ring present. Gills usually free, rarely adnexed or adnate. (Volva sometimes not evident round the base of the stem, but loose patches on the cap prove its presence.) *Amanita.*

Volva present, ring absent ; gills free. *Amanitopsis.*

Ring present, volva absent ; gills free. (In some species the ring is imperfect, and in a few the gills are slightly joined to the stem.) *Lepiota.*

Gills free ; volva and ring absent. *Schulzeria.*

Gills attached to the stem ; ring present, volva absent. *Armillaria.*

†† *Gills adnexed or adnate ; ring and volva absent.*

Gills sinuate ; general structure fleshy, stem stout. *Tricholoma.*

Gills very rigid and brittle ; general structure fleshy, stem stout. *Russula.*

Cap slender, usually striate ; edge of cap straight and pressed close to the stem when young. *Mycena.*

Cap rather fleshy, soon becoming almost plane, edge of cap incurved when young ; stem cartilaginous outside. *Collybia.*

Entire fungus tough, drying up and reviving when moistened ; gills often connected by veins. *Marasmius.*

††† *Gills decurrent.*

Substance of flesh exuding milk when broken. (In some species the gills are adnate.) *Lactarius.*

Gills thick at the base, edge sharp, rather waxy, often branched. Cap often hygrophanous. (In some species the gills are adnate or even free.) *Hygrophorus.*

Gills thin, pliant, sometimes powdered with the spores ; stem fibrous outside. *Clitocybe*.

Structural characters same as in *Clitocybe*, but the spores are globose and warted, and remain for some time on the gills, covering them with a white bloom or powder. *Laccaria*.

Gills thin and pliant ; stem cartilaginous outside. *Omphalia*.

Growing on wood. Stem lateral (from edge of cap), or excentric (springing near to edge of cap, not central), when present. *Pleurotus*.

Gills narrow, edge thick or blunt, rather waxy, forking.

*Cantharellus*.

Gills narrow, thick, edge blunt ; growing on other fungi. *Nyctalis*.

\*\* TENACES.—Coriaceous, corky, or woody, persistent, rigid when dry.

Cap coriaceous ; gills decurrent, edge toothed or eroded. *Lentinus*.

Cap coriaceous ; gills decurrent, edge quite entire. *Panus*.

Cap coriaceous ; gills forking, edge thick and blunt. *Xerotus*.

Cap growing horizontally, sessile (=stalkless), woody or corky ; gills radiating from the point of attachment. *Lenzites*.

## II.—*Schizophyllæ*

Edge of gills split open.

Gills narrow and resembling folds or wrinkles, edge grooved. (In the only British species, the edge of the gills is not grooved, hence the species is off type.) *Trogia*.

Edge of gills split down for a short distance, the split portions rolled outwards. *Schizophyllum*.

If all the species belonging to each genus were quite typical in structure, the above key would at once enable a species to be assigned to its proper genus. But all species are not equally typical, and yet have more points in common with one particular genus than with any other. The following notes on the genera will assist in grasping the range of form and structure included in each genus.

## NOTES ON THE GENERA

### *Amanita*

Morphologically, that is structurally, *Amanita* shows more specialized points of structure than are to be met with in any other genus included in the Basidiomycetes. In the most highly evolved species the entire plant, when young, is enclosed in a universal veil, which remains intact until the stem, cap, and gills are completely differentiated, when by increase in length of the stem and the expansion of the cap it is ruptured, leaving a more or less loose sheath round the base of the stem, called the volva. The upper portion of the universal veil usually remains on the surface of the



cap or pileus, where by the gradual expansion of the cap it is broken up into irregular patches, which in most cases remain throughout the life of the fungus ; in other instances they gradually disappear, being washed off by rain, etc. After the universal veil has been ruptured and the cap has commenced to expand, the secondary veil may be seen as a firm, felted or interwoven membrane, stretched between the upper part of the stem and the edge or margin of the cap. This secondary veil serves to protect the gills until the spores are formed, when by the gradual growth and straightening out of the edge of the cap, it breaks away from the edge of the cap and remains as a ring or collar round the stem. After these phases of development have passed, the cap expands to its full size, the stem attains its full length, the spores mature and are dispersed, and the entire fungus rapidly decays.

So much for the structure of typical species, but when the student begins to examine fungi in the field, he will be confronted with what the beginner considers, and with a very great amount of truth, serious difficulties ; he will encounter species which a more advanced student will explain to him as departures from the orthodox type species, and yet belonging to the genus *Amanita*. For example, he will encounter species where the large, well-developed volva present in such a species as *Amanita phalloides* is reduced to an apology for a volva, and represented by mere loose patches of membrane surrounding the thickened base of the stem, as in the Fly Agaric (*Amanita muscaria*). Again, the ring on the stem, which is so very conspicuous in the fully developed stage in the Fly Agaric and in *Amanita phalloides*, is in many species reduced to mere shreds in the adult stage of many species, or it may entirely disappear with age, although quite obvious in the young condition of the fungus ; hence it is necessary to examine a fungus in various stages of development, and not only when it is quite mature, to arrive at its affinities. The gills are quite free in typical species, but in others are adnexed or adnate.

The question that naturally suggests itself after reading the foregoing, is, How am I to know in reality to what genus a particular fungus does belong, that is said to be " off type " ? At the commencement of the study, such species cannot be located, and at this point the assistance of a more experienced person is invaluable. With a little experience, the student that cannot determine the exact genus to which a fungus belongs will at all events be able to recognize the two or three genera to which it could possibly belong, and by gradually excluding those possessing least points in common, and by a process of analogy, or comparison with other known species, will arrive at the correct genus.

The genus *Amanita* is remarkable for including closely allied species which are respectively one of the best of our edible species (*A. rubescens*), and certainly our most poisonous species (*A. phal-*

*loides*). *A. rubescens* is likely to be confounded with *A. pantherina*, a poisonous species, by the beginner, hence it is advisable to leave species of *Amanita* severely alone, from the edible standpoint, until the student is quite certain as to his determination. *A. phalloides* is rather difficult to distinguish from *A. mappa*, which is also poisonous.

No other agarics have a complete volva and ring present.

The species are usually of large size, grow on the ground, and speedily decay after reaching maturity.

### *Amanitopsis*

This genus is closely allied to *Amanita*, and was included in that genus at one time. It differs in the entire absence of a ring on the stem, in fact the secondary veil is entirely absent from the earliest stage of development. The volva is ample and persistent; the upper portion of the primary veil is sometimes carried up by the cap, and persists under the form of felty patches, in other examples there is no trace of patches on the cap. These patches or warts in *Amanita* and the present genus are usually readily separable from the cuticle of the cap, and are only mechanically held or stuck to it, and must not be confounded with true scales or warts formed by the true cuticle of the cap, as in other genera that follow. The gills are perfectly free from the stem, there being an obvious space, devoid of gills between the stem and the commencement of the gills. In this genus it is usually stated in books that the flesh of the hymenophore (=cap) is distinct from that of the stem, which means that the stem shows a line of demarcation at the point where it enters the flesh of the stem, and looks as if the rounded end of the stem had been pushed into the flesh of the cap without having any organic connection with it. The same character is obvious in the most perfect forms of *Amanita*, but not in all the degraded species.

We have only one species in Britain (*A. vaginata*), having a mouse-grey or dull lead-coloured cap. There are two varieties, one entirely white, and the other with a tawny or orange-brown cap. The typical form is one of the best of our edible fungi, but the tawny variety is not wholesome.

### *Lepiota*

The leading features of this genus are the free gills and the presence of a ring on the stem. There is no trace of a volva at any stage of development. The structure of the stem is differentiated from the flesh of the cap as in *Amanita* and *Amanitopsis*. This structural feature is entirely absent from all the following genera. As the student will now begin to expect, the features given above as characteristic of the most highly developed, or central types of



the genus, are not so obvious, or may practically disappear in species receding from the type forms, but which are yet obviously more closely allied to *Lepiota* than to any other genus. In *Lepiota procera*, which may be considered as the type of the genus, the ring is well developed, and after breaking away from the edge of the cap, also becomes quite free from the stem, which it surrounds as a loose ring which can be moved up and down. In other species the ring is said to be fixed, that is, it remains attached to the stem, and cannot be moved up and down like a loose ring. In other species the ring, although quite obvious when the fungus is young, becomes very rudimentary or may entirely disappear before the fungus reaches maturity. In the larger and more perfect species the gills are separated from the stem by a distinct space, whereas in many of the smaller kinds the gills approach so near to the stem that it is only by courtesy that they can be called free. The cap is generally more or less scaly or granular, rarely almost smooth and viscid or sticky. The stem is almost invariably more or less hollow.

Some of the species are amongst the largest of our agarics, others are quite small. Several are edible, none are known to be poisonous.

### *Schulzeria*

This genus is characterized by having free gills, and no trace of a ring or a volva. It is very closely allied to *Lepiota*, perhaps too closely to be a good genus, as in many of the simpler forms of *Lepiota* the ring is very evanescent, and after it has disappeared the fungus is technically a *Schulzeria*, and it is only by finding the fungus in quite a young state that it can be determined as a *Lepiota*.

### *Armillaria*

The marked features of this genus are the presence of a ring on the stem, and the gills always being more or less attached to the stem. *Armillaria* is a somewhat difficult genus to grasp by the beginner; in some species the ring remains intact when the fungus is mature, and in such cases there is no difficulty in locating the species; in others, however, the ring disappears at an early stage of development, and if an adult specimen of such species is met with, it proves a difficult matter to decide its genus. In those species where the ring disappears from the stem at an early stage of growth, the resemblance to species of *Tricholoma* is considerable; but such are readily distinguished by the gills not being sinuate, a characteristic feature of *Tricholoma*. On the other hand, curiously enough, those species of *Armillaria* in which the ring is permanent have the gills sinuate as in the genus *Tricholoma*. Taking altogether the sum of characters constituting the genus *Armillaria*, it may be said that so far as the attachment of the gills is concerned, but for the presence of a ring, the species would fall naturally, depending



on the attachment of the gills to the stem, into three groups belonging respectively to the genera *Tricholoma*, *Clitocybe*, and *Collybia*.

The species grow on wood ; they frequently appear to grow on the ground, but if carefully examined it will be found that the mycelium originates from buried wood, roots, etc. Some species, as *A. melleus*, are very destructive parasites, and spread from tree to tree by means of underground mycelium. None are edible or certainly not worth eating, although *A. melleus* and *A. mucidus* are sometimes recommended.

### *Tricholoma*

This is one of the genera containing a large number of species characterized more especially by the sinuate gills. The species are mostly of large size and robust build, having a fairly thick, fleshy cap and short, stout stem. No trace of ring or volva is present. The cap is often scaly, the scales usually being adpressed or flattened and adhering to the cap. In other cases the cap is viscid, sometimes glutinous. The stem is usually solid and fibrous throughout, that is, it is composed of a compacted bundle of longitudinally arranged strands or fibres. This structure is apparent on the outside, hence the stem is described as fibrous, as opposed to those fungi having the stem corticated or polished on the outside and showing no fibrous structure. The gills vary considerably in colour, being white in some species, dark grey in others, and yellow in a few species. The sinuation of the gills is very marked in many species, in others the character is but vaguely indicated. The spores are white in all species independent of the colour of the gills.

*Tricholoma* is closely allied to the following genera. Species of *Pleurotus* having the stem central are mainly distinguished by growing on wood. *Collybia* differs in the corticated or polished stem. *Clitocybe* is distinguished by the gills never being sinuate, and always more or less decurrent.

All the species, with one or two exceptions, grow on the ground ; the majority appear in the autumn, but a few of the larger species, as St. George's mushroom, *T. gambosum*, an edible species, appear in the spring. Some species, as *T. sulfureum*, have a very unpleasant smell. In many species the gills become spotted or stained with brown or rust colour.

### *Russula*

A very large genus of fungi, and one which cannot be mistaken when the features are once grasped, but they are perhaps somewhat difficult to convey in writing. The species are generally large and stout, very rigid, the flesh of the cap is thick, compact, and firm, the stem is stout, short, and never perfectly hollow, although in some species it is described as being stuffed, which means that the central

portion is loose and spongy in texture, as compared with the firm peripheral portion. The gills are usually adnexed, or in some species almost free; they are rather thick, except at the edge, razor-blade shaped, very firm and brittle, so that when an attempt is made to bend them to one side they snap off abruptly. In many species the gills are pure white, as are also the spores; in others the gills and spores are tinged yellow, whereas in others again the gills and spores are deep ochraceous yellow. This genus illustrates the impossibility of nature to conform with any system of classification that can be formulated. The genus by common consent is included in the *Leucosporeæ*, characterized solely by having white or colourless spores, nevertheless the species having white and ochraceous spores so obviously belong to the same genus in every other respect, that the one departure in the way of coloured spores is waived, and *Russula* is retained in the white-spored group. Those possessing a microscope and the ability to cut a thin section across a gill, have the means of determining at once whether a given fungus belongs to the genus *Russula* or not. The gills in *Russula* are said to possess a vesiculose structure, that is, all the cells are circular in outline in whatever direction the gill is cut, whereas in the gill of every other agaric the middle portion of the gill consists of a web of very long, narrow cells. Intermixed with these large circular cells, forming the substance of the gill, are numerous long, thin, wavy cells, filled with an opaque, cloudy or minutely granular substance, or latex, which correspond to the milk-containing hyphæ or cells so abundant in the allied genus *Lactarius*. In *Russula* the latex is too dense to escape in drops when the plant is wounded, as it does in the genus *Lactarius*. The spores in all species are subglobose and minutely rough or warted.

Brilliant colours predominate in the genus, vivid crimson, bright yellow, deep green, orange, ripe peach-colour, and in some species the most varied combinations of red, green, orange, etc. Many of the species appear early in the season, and make the woods and open glades gay with their brilliant colours. All the species without exception grow on the ground. Some few species are edible, but the majority are hot and not suitable for food, although not actually poisonous.

### *Mycena*

A considerable number of fungi belong to this genus, most of which are small in size, and usually quite brittle and evanescent. The cap is as a rule campanulate at first, gradually expanding until more or less plane, rarely much depressed, sometimes umbonate, and usually striate or fluted, never scaly. The flesh of the cap is always thin, and sometimes almost translucent. The stem is comparatively slender, hollow, externally polished or shining and often furnished with downy mycelium at the base. One marked



peculiarity of some species is the presence of latex in the stem, which when broken near the base liberates drops of liquid or latex, which is snow-white, rose-colour, or blood-red in different species. The gills are adnexed, and in many species there is a distinct decurrent tooth running slightly down the stem. They are in some instances entirely pure white, in another section white with a distinctly coloured edge or margin, whereas in another section the gills are grey. In *Mycena pelianthina* the gills are reddish and bristle along the margin, and also on the sides, with very large purple cystidia or large projecting cells, which can be seen very clearly under a pocket lens, or still better under a microscope. Some species possess a strong alkaline smell, somewhat resembling ammonia, especially when crushed. The spores of many species possess the same amount of refrangibility as water, hence they cannot be distinctly seen when examined in water under the microscope, and although the spores are elliptical in outline, they have been frequently described as globose, due to the fact that a large globose oil globule is distinctly visible, whereas the true outline of the spore is almost invisible. The addition of a little tincture of iodine or other stain shows up the true shape of the spores.

The genus *Mycena* is perhaps most closely related to *Collybia*, which differs in having the edge of the cap incurved in the young state, whereas in *Mycena* the edge of the cap is straight and pressed to the stem in the young condition. Again, species of *Mycena* are as remarkable for being brittle as species of *Collybia* are for being tough and pliant. *Omphalia* and *Clitocybe* are distinguished from *Mycena* by having decurrent gills.

Many kinds of *Mycena* spring up among short grass on lawns, in pastures, woods, etc. Others grow on fallen branches or on stumps; some of the smallest species grow on the bark of living trees, more especially when the trunk is more or less covered with moss.

### *Collybia*

Here again we have a considerable number of British species to deal with, and, as distinguished from allies, the principal features to be observed are the comparatively tough consistency of the entire fungus, the incurved edge of the cap in the young stage, the absence of fluting or striation on the cap, and the polished or cartilaginous stem. The genus *Marasmius* is undoubtedly most closely allied to *Collybia*—in fact, several species often find a temporary resting-place first in one genus, then in the other, depending on the view taken by a particular author. Broadly speaking, *Marasmius* differs from *Collybia* in the dry, leathery consistency of the entire fungus, which is somewhat persistent, and revives readily when moistened after being dried; whereas in *Collybia* the entire fungus quickly decays after reaching maturity and shedding its spores.

In *Collybia* the cap is usually thin, not fluted, and rarely indistinctly striate, never distinctly scaly, generally becoming more or less plane at maturity, often more or less umbonate. The gills are adnexed and rounded behind, or in some species they are practically free, usually thin and pliant, and vary in colour from white to grey in different species. In some members, as *C. platyphylla*, the gills are exceptionally broad. The stem is usually comparatively long, and may be, as is generally the case, smooth and polished; whereas in a few species it is velvety. In some species, as *C. radicata*, it ends in a long, rooting base, which is longer than the portion above ground. A strong alkaline or rancid smell is peculiar to some species. Most grow on the ground, but some are met with growing on wood, fallen fir cones, etc.

### *Marasmius*

Another genus of fungi containing many British species. The principal features of the genus as contrasted with *Collybia* are given in the notes for the last-named genus. The most pronounced features to remember are the general toughness and elasticity of the entire fungus, and its power of assuming its natural form when moistened after being dried; whereas in practically all other agarics no amount of soaking will cause a specimen to present any semblance of its original form after being once dried. In *Marasmius* the cap may be perfectly even, striate, or deeply fluted, generally smooth, but certainly never anything approaching to scaly; the flesh is always very thin and pliant. The gills are variously attached to the stem in different species, adnexed, free, or in some few species the gills are attached to a ring or collar which loosely surrounds the apex of the stem. The gills are connected by veins or raised ridges, which cross over from one gill to another in many species. The stem is usually long and slender, in some species polished, in others velvety, in some kinds very minutely, so that when dry the stem presents a whitish, hoary appearance. Several species possess a strong smell resembling garlic, and in one or two species the smell is very strong and foetid. The majority of species grow on wood or fallen branches, but some of the minute species, with black, thread-like, long stems, grow on dead, fallen leaves. One minute species which is only met with on dead, fallen holly leaves, called *M. hudsoni*, has numerous long, slender, blackish purple spines or hairs spreading from the cap and stem. This feature is unique so far as British agarics are concerned.

### *Lactarius*

The presence of a white or coloured liquid or "milk," which flows in drops from the cap or gills when wounded, is the most pronounced character of the genus *Lactarius*, and the only one that separates it from its closest ally, *Russula*; in other respects



the two genera have many features in common, including the general rigidity of the cap and stem, the presence of numerous laticiferous hyphæ, or hyphæ that contain the milk, and more especially in producing globose or subglobose, rough spores. In the great majority of other genera included in the Leucosporeæ the spores are elliptical and smooth. The cap in most species soon becomes expanded, the centre often more or less depressed, less frequently umbonate, the edge usually remains more or less inturned, and a striated edge is quite rare in the genus. The cap is never ornamented with scales having their points free and spreading, but is in many species marked with concentric zones deeper in colour than the fundamental tint. The gills are most frequently more or less decurrent, but in some species they are adnate or adnexed. They are fairly rigid, unequal in length, or with shorter ones intermixed, often forked, edge sharp. Stem stout, rigid, central or rarely excentric, or almost springing from the edge. The latex is persistently milk-white in the majority of species; in others it is white at first, changing to some other colour when exposed to the air; while in others, again, the latex is coloured yellow or red before escaping from the plant. In some species the latex is quite tasteless, or mild as it is termed. In others it is intensely acrid and hot, even when tasted in the smallest quantity. These points respecting the colour and taste of the latex must be carefully noted, as they are of great importance in the determination of species. The genus does not include any brilliantly coloured species, the prevailing colour being some shade of brick-red or yellowish brown. Some few species are edible; one species, *L. deliciosus*, has been esteemed as an article of food for ages gone by, and was described by the ancients as "food for the gods."

### *Hygrophorus*

This genus undoubtedly includes amongst its many species some of the most beautiful fungi included in the British Fungus-Flora. For brilliant tints and beauty of form it is unequalled, and as a personal opinion I consider that *Hygrophorus calyptratus* decidedly heads the list. I will not attempt the impossible, so leave the decision to those in a position to contrast its beauty with that of others generally. Although it is practically impossible to mistake a species of *Hygrophorus* for anything else after a little experience in the field, it is nevertheless difficult to express in writing any technical features that at once stamp the genus. An essential point that cannot be grasped by the beginner is that at length the hymenium becomes soft and readily separates from the trama, which, being literally interpreted means that the superficial film of the gill, composed of the basidia, etc., can be readily rubbed away from the central portion of the gill, called the trama. A

point of importance in recognizing the gills is the rigid, or what is usually termed the waxy nature of the gills, which are comparatively thick where they join the cap, and gradually taper to a sharp edge, resembling a section of a blade of a razor. They are usually distant from each other, and in this respect approach the genus *Cantharellus*, which differs in having the edge of the gills thick and blunt. The gills are often decurrent, but sometimes adnate or only adnexed. The cap may be regular, but more frequently it is folded or plicate below, and the margin is often irregularly wavy or lobed. It is generally smooth, and often polished and shining. As the cap expands, the gills, that were originally adnate or adnexed, break away and appear to be free from the stem, as in reality they are ; but on careful examination the portion of the gill that was originally attached to the stem can be distinctly seen, and their true original mode of attachment determined. The stem is usually polished externally, and hollow or stuffed.

A few species are universally acknowledged as edible ; none are known to be directly poisonous. The common buff-coloured species, called *H. pratensis*, common on open grass-lands, is an excellent edible species, as are the pure white *H. niveus* and *H. virgineus*, met with in similar situations.

The species without exception grow on the ground.

### *Clitocybe*

A very large genus of fungi, including, to my mind, certain sections that require more care and experience combined, for their correct determination, than is the case in any other genus. This is especially true of the white species so common in our woods, which in their intricacies of relationship may be compared with the brambles, roses, and hawkweeds, etc., and unfortunately, owing to the absence of sexuality in the agarics, the mycologist cannot fall back on hybridization. No one morphological or structural character is constant throughout the genus. It is generally stated that the gills are more or less decurrent, and this statement is true of many species, but not all ; in some the gills are adnate or adnexed, but in these last forms the remaining characters are so typical of *Clitocybe* that such species are kept in the genus. The gills are never sinuate, which separates this genus from *Tricholoma*, with which it agrees in having a fibrous stem. *Clitocybe* agrees with *Omphalia* in often having decurrent gills, but the last-named genus differs markedly in having the stem corticated or polished externally, instead of being loosely fibrous. *Collybia* differs from the present genus in having the gills adnexed, and distinctly rounded behind.

The cap is usually fleshy at the disc, and becomes quite thin towards the edge ; there is a general tendency to become more or



less depressed at the centre, reaching the funnel-shaped stage in some species. Prominent scales are absent in all cases, striation of the edge infrequent ; but in many thin-capped species the edge becomes irregularly wavy.

The stem is usually distinctly fibrous externally, somewhat tough or elastic, generally stuffed, and sometimes becoming hollow with age.

Brilliant colouring is absent ; many of the species are white, then follows various shades of grey or buff. Some of the species are amongst the largest of our agarics, the very large, white, funnel-shaped kinds being excellent from a culinary point of view.

A few species have a pleasant spicy smell, resembling aniseed.

All grow on the ground, usually in tufts or clusters.

### *Laccaria*

The few species included in this genus were at one time included in *Clitocybe*, with which genus they agree in structural characters, but differ in having globose, warted spores, which persist on the gills for some time, giving them a mealy appearance. *L. laccata* is one of the commonest of fungi in our woods in the autumn, and is usually of a deep amethyst or purple colour when moist, becoming pale when dry. A second species, or a variety of *L. laccata*, as it is considered by some, is of a deep orange-brown colour when moist.

### *Omphalia*

The species generally are small and delicate. The cap is almost invariably depressed, often to the extent of becoming funnel-shaped, and the gills are truly decurrent, two characters, it will be remembered, that are also common to *Clitocybe* ; but in the present genus the stem is corticated and polished, which in reality is the only constant difference between the two genera. As usual, when the cap is depressed or funnel-shaped the margin is arched or turned in more or less, and often striate or grooved. The cap is never truly scaly, and most frequently quite smooth. In some species the cap is very *hygrophanous*—that is, it absorbs water very readily and also parts with it quite as readily in dry air ; hence the cap varies much in colour, being quite dark when it is saturated with water, and becoming quite pale when quite dry. In some species the cap commences to dry at the disc or apex first, and gradually dries downwards towards the edge ; in other species the order of drying is reversed, commencing at the edge first, and drying out upwards ; this mode, however, is by far the rarest. Everyone who has observed fungi in their native habitats, and under natural conditions, must have noticed that the cap often shows two distinct colours, one portion being much darker than the other. This is due to the drying-out process described above, the darker portion being yet waterlogged. Another peculiar

appearance due to the presence of any excess of water in the substance of the cap is that termed "pellucidly striate." A truly striate cap means that shallow ridges and furrows alternate ; but in a pellucidly striate cap, which can only exist when the cap is saturated with water, there only occur alternating parallel darker and lighter streaks on the cap, the surface being quite even. This appearance is due to the fact that those portions of the cap between the gills is thinner in flesh than those portions of the cap from which the gills originate ; hence the thinner portions of the cap, between the gills, hold less moisture than those portions from which the gills spring, and are consequently paler in colour. In other words, the darker lines correspond to the position of the gills springing from the cap. Hygrophanous or water-absorbing species of fungi occur in many other genera of fungi in addition to *Omphalia*, and the above explanation applies to all such. In many species of *Omphalia* the gills are remarkably distant, that is, wide apart, and in such cases they are generally comparatively thick at the point where they spring from the cap, but become thin and sharp or acute at the edge. With very few exceptions there are very few bright-coloured species in the genus under consideration. None are recognized as being of any value from a culinary point of view. Neither taste nor smell are marked features of the genus.

Many of the species grow on twigs, wood, etc., although some are met with amongst sphagnum, etc., in swampy places, and others grow on the ground. Some of the species are amongst the smallest fungi known.

### *Pleurotus*

All the species grow on wood. In the most typical forms the gills are decurrent, often very deeply so, and in some instances the gills anastomose or join on to each other when they reach the stem, and are there inclined to form irregular pores. In some species the gills end abruptly behind, and do not run down the stem in a decurrent manner. Yet there is a certain combination of characters which collectively suggest the genus *Pleurotus*. The stem is sometimes quite lateral, or springing from the edge of the cap ; in other species the stem is excentric, or originating from a point near to the edge of the cap, but not from the centre, hence the cap itself is more or less unsymmetrical. In some of the simpler forms the stem is absent, and the cap is attached by its edge to the substance it is growing upon. Again, in the most highly developed forms there is a more or less evident ring on the stem.

The species vary greatly in size, some being amongst the largest of our agarics ; while other minute forms growing on moss, etc., are only two or three lines across. *Pleurotus ostreatus*, so called on account of the more or less oyster-shell shaped cap, is included amongst the best and safest of our edible fungi.



*Cantharellus*

The most striking character of this genus consists of the peculiar structure of the gills, which in books are described as fold-like structures, which literally means that they are relatively narrow and equally thick throughout their entire width, thus differing from ordinary gills, which are thick at the base or the point where they spring from the stem, and gradually become thinner up to the edge, like a section of the blade of a razor. In many of the smaller, reduced species the gills are certainly reduced to blunt folds or wrinkles. As a rule the gills are decurrent, often forking, straight, that is, rarely joining each other during their course down the cap. A greater variety of form and structure of the cap is met with in *Cantharellus* than in any other known genus. In the higher forms it is firm and very fleshy, often wavy or very irregular in outline. In another section of the genus the cap passes to the other extreme, and is very thin, almost membranaceous, usually wavy, more especially towards the arched or down-turned edge. In this section the cap is usually infundibuliform, the hollow of the cap being continuous with that of the hollow stem down to its base. In a third section, embracing the simplest and most reduced species, the cap is often very thin and minute, resembling a thin, flat or wavy membrane with a few distant, very narrow folds, a mere apology for gills. In such species the stem is often very short and lateral, that is, springing from the edge of the cap, or may be quite absent. Such minute species often grow on the larger mosses in damp places.

It may be truly said that *Cantharellus* is one of those genera which does not suggest itself at sight because you happen to know one or more species. The thick-edged, fold or wrinkle-like gills are the feature that indicates the genus.

*Nyctalis*

This genus agrees to some extent with *Cantharellus* in having blunt or thick-edged gills, which are soft in consistency, but is readily distinguished by the fact that the species grow only on the larger agarics when in a decaying condition. The species are small, rarely exceeding  $\frac{1}{2}$ – $\frac{3}{4}$  in. across the cap. The most remarkable feature about the species included in *Nyctalis* is the presence of a dense layer of conidia produced on the surface of the cap, giving to it a mealy appearance. On germination these conidia produce a mycelium which produces the fungus, whereas the true spores germinate very tardily or not at all. It would appear that in this genus the secondary conidia produced on the top of the cap are going to supersede the function of true spores in the continuation of the species.

*Lentinus*

Up to the present all the species of fungi dealt with have been of a putrescent nature, that is, they perish almost immediately after their full development; whereas in the present genus the members are more or less woody or corky in consistency, very firm or even hard, especially the stem, and persist for quite a time after their complete development.

The genus manifests considerable variety of form; the chief features to be kept in view are the tough, woody or corky texture, and the more or less decurrent gills, having the thin edge or margin irregularly toothed or torn. The cap is always more or less irregular in form, usually depressed, sometimes scaly. The gills are sometimes deeply decurrent, at others only slightly so, but the edge is always more or less broken. The stem is hard and woody, sometimes rooting or penetrating the matrix. It may be central, excentric, or placed towards one side of the cap; lateral or growing from the edge, or it may be entirely absent.

One species, *L. lepideus*, is very destructive to worked wood, and does very considerable damage to railway sleepers in the United States. It is also common on the wood used for props in coal-pits, etc., in this country, where it often assumes very grotesque forms when grown in darkness. All the species grow on wood, and none are edible.

*Panus*

This genus agrees with *Lentinus* in many particulars, and unless care is exercised there will be trouble in clearly discriminating between the two. The dry, tough, leathery consistency is common to both, as is also the decurrent gills and the excentric or lateral stem, or the entire absence of the stem. The only absolute point of structural difference between the two genera lies in the fact that in *Lentinus* the edge of the gill is toothed or broken (sometimes a pocket-lens character), whereas in *Panus* the edge or margin is entire or unbroken, like the edge of a good razor. In both genera the edge of the gill is thin or sharp. The cap is always more or less irregular in outline in the higher forms, often wavy, stem excentric, gills narrow, often very narrow, thin, and closely crowded, decurrent, and running down the stem for some distance as lines.

In another section of the genus the stem is lateral, often very short; here the cap is flat or oyster-shell shaped, and generally more or less scurfy. The species are small, rarely exceeding an inch across the cap. One common species belonging to this section, called *P. stypticus*, has a very hot and pungent taste. In a third, degenerate section the stem is entirely absent, the cap being either attached by one edge to the matrix, or resupinate.

All the species grow on wood or branches. None are edible.



*Xerotus*

We have only one reputed British species belonging to this genus, which is probably more mythical than real, so far as this country is concerned. A fungus was figured by one of the old authors about a century ago, and someone coming on the scene later considered that the figure belonged to the genus *Xerotus*. No such fungus has, however, been met with in modern times ; in fact, the fungus that was figured was perhaps the only one that ever occurred in this country. However, as fungi are such erratic organisms, it has been included from a sentimental standpoint.

*Xerotus* is fairly represented in tropical and sub-tropical countries, and one peculiarity of most of the species is that, whatever colour they may be when growing, they almost invariably change to a dark leaden grey or black colour when dried. The cap is very thin and tough, as are the gills, which at first resemble mere folds or ribs, with an entire or unbroken, blunt edge, and often fork. Stem central in our reputed species, but in some species excentric.

*Lenzites*

Woody. Cap horizontal, dimidiate, that is, projecting horizontally, roughly semicircular, and fixed by a broad base, hence sessile ; the gills are simple or forked, and sometimes anastomose to form irregular pores, thus leading up to the typical porous hymenium characteristic of the Polyporaceæ. However, the gills retain much more of the structure characteristic of the Agaricaceæ ; but *Lenzites* may undoubtedly be considered, along with *Dædalea* and certain other genera, as transition forms between the two families.

All the species grow on trunks, stumps, rails, etc.

*Trogia*

This is a paradoxical genus, so far as its one British species is concerned. The genus is known by having thickish, fold-like gills with a shallow groove running along the edge ; in other words, the edge of the gill is split into two layers, as in the genus *Schizophyllum*. But, curiously enough, in the single British species the edge of the gill is not split or channelled ; but it occurred to someone some time ago that, notwithstanding the fact that the gill edge was not grooved, the fungus agreed more nearly with *Trogia* than with any other genus, and so it has remained in *Trogia*. French mycologists consider the fungus in question to be a *Merulius*. Future investigation must decide, but it is not properly a *Trogia*.

*Schizophyllum*

*Schizophyllum commune*, the only European representative of the genus, is very rare in this country. I once found it on an old trunk in the neighbourhood of Scarborough, and it has occurred rarely elsewhere. It is not uncommon in the mountainous parts of Europe. On the other hand, the genus is commonly represented in tropical and subtropical countries. *S. commune* is a thin, dry, whitish fungus, more or less fan-shaped, having the edge more or less irregular, sometimes scalloped; the gills are brownish, and radiate from the point of attachment. The only truly distinctive mark of the genus consists in the edge of the gills being split for a short distance, the two portions of the split portion being curved outwards.

## AMANITA

The universal veil enclosing the whole fungus when young, becoming ruptured by the increase in length of the stem, one portion remaining as a volva or sheath encircling the base of the stem, the remainder usually forming separable patches or warts on the cap; stem central; gills free.

*Amanitopsis* differs in the absence of a ring, and *Lepiota* in the absence of a volva.

\* *Edge of volva loose and free from the stem, persistent.*

† *Cap white or with a tinge of yellow.*

*A. virosa* (Pl. I, fig. 1).—Entirely white. Foetid. Cap 3–4 in. across, conical, then expanded; gills crowded; stem 4–6 in. long, stout, narrowed upwards, squamulose; ring irregularly torn, volva large, lax.

In damp woods. Poisonous.

var. *grisea*.—Similar in size to the typical form, but the cap is shaded with grey.

On the ground in Epping Forest.

*A. mappa*.—Cap 2–3 in. across, orbicular, white or with just a tinge of yellow; gills crowded, narrow; stem 2–3 in. long, white; ring lax, usually torn, volva adnate to the bulb of the stem with a narrow, free edge.

There are usually a few irregular patches on the cap. Differs from *A. phalloides* in the shorter stem, and edge of the volva only free. Smell strong. Poisonous. In woods.

†† *Cap yellow, sometimes tinged red.*

*A. phalloides* (Pl. II, fig. 1).—Cap 3–4 in. across, viscid when moist, usually pale primrose-yellow, sometimes with a tinge of green, at others whitish; gills pure white; stem 3–5 in. long, tapering upwards slightly from a bulbous base, white; ring large, volva large, loose, edge uneven.



## PLATE I

1. AMANITA VIROSA
2. LEPIOTA AMIANTHINA
3. SECTION THROUGH CAP OF FIG. 2
4. AMANITA ASPER
5. SECTION THROUGH CAP OF FIG. 4
6. LEPIOTA GLIODERMA

Distinguished by the large, free volva and large ring. Our most poisonous fungus, and responsible for the majority of deaths actually due to fungus poisoning, both in Europe and the United States.

In woods and open places near trees.

*A. junquillea*.—Cap 2–3 in. across, viscid, pale orange or lemon-yellow; gills slightly adnexed; stem 2–3 in. long, bulbous, tinged yellow, as is also the fugacious ring; volva lax.

In woods.

*A. lutea*.—Cap 2–3 in. across, viscid, edge striate, disc papillose, yellow or ochraceous; gills white, crowded; stem 2–3 in. long, narrowed upwards, bulbous, ring and volva thin in texture.

In woods, etc.

\*\* *Volva without a distinct free margin, often broken up into concentric ridges at base of stem, sometimes almost obsolete.*

† *Cap red, reddish brown, or brown.*

*A. muscaria* (Fly Mushroom) (Pl. II, fig. 5).—Cap 4–9 in. across, globose, then plane, edge striate, usually deep scarlet, sometimes orange, bleaching when old, with scattered white patches of the volva; gills white; stem 4–7 in. high, whitish, ring lax, volva broken up into concentric rings.

In woods, especially birch and fir. Poisonous.

*A. pantherina*.—Cap 3–4 in. across, flesh persistently white, as is also that of the stem, viscid, reddish yellow or brownish, with pale, flat warts; gills white; stem 4–5 in. long, not very thick, bulbous, whitish, ring usually obliquely placed on the stem, volva adnate, extreme edge free.

In woods and pastures under trees. Poisonous

*A. puella*.—Cap convex, then expanded, edge striate, somewhat viscid, naked (=no patches of volva present), yellow or reddish yellow, disc sometimes red,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills free, rather distant, white; stem  $2\frac{1}{2}$ –4 in. long, rather slender, even, smooth, white, ring rather large, often drooping, volva with the upper portion quite free from the stem, edge torn, often soon breaking away.

This fungus is by some considered as a variety of *Amanita muscaria*, from which it differs very materially in the behaviour of the universal veil, which in *A. muscaria* adheres very closely to the cap and is carried up by it under the form of white patches, and there is practically no free portion left as a volva; whereas in *A. puella* the cap does not carry up the universal veil, which consequently remains as a good volva. The fungus is also much smaller and more slender than *A. muscaria*.

In woods and on their borders, etc.



## PLATE II

- I. AMANITA PHALLOIDES
2. SECTION OF CAP OF FIG. I
3. AMANITOPSIS VAGINATA
4.       ,,       FULVA
5. AMANITA MUSCARIA (FLY AGARIC)
6. SECTION OF CAP OF FIG. 5

*(See frontispiece.)*



PLATE II.





*A. recutita*.—Cap 3–4 in. across, grey or brownish ; gills forming fine lines down the stem ; stem narrowed upwards, silky, white, ring white, edge of volva not free.

In woods.

*A. rubescens* (Pl. III, fig. 5).—Cap 3–5 in. across, reddish brown or dingy flesh-colour, with small adnate warts ; gills touching the stem and running down it as fine lines ; stem about 3 in. long, narrowed upwards, whitish, then stained red, ring large, volva nearly obliterated, forming irregular rings round bulbous base of stem. Flesh of cap and stem white, changing to reddish brown when cut.

Readily known if attention is paid to the change of colour in the flesh, hence its name. Edible.

In woods and under trees in open places.

*A. magnifica*.—Cap 3–5 in. across, reddish brown or liver-colour, edge striate ; gills adnexed ; stem 4–5 in. long, scaly and coloured like the cap up to the large ring, volva obliterated.

Under beech trees, etc.

*A. megalodactyla*.—Strong smelling. Cap 2–2½ in. across, reddish grey ; gills broad, becoming tinged with red ; stem 4–5 in. long, slightly bulbous, white ; ring large, volva obliterated.

In woods.

*A. asper* (Pl. I, fig. 4).—Cap 2–3 in. across, convex, then plane, reddish brown, with firmly attached small warts ; gills white ; stem 2–3 in. long, narrowed upwards from the wrinkled bulb, squamulose, white ; ring entire.

Free edge of volva obsolete and the firmly attached small, sharp warts on the cap distinguish this species.

In woods, especially beech.

*A. excelsa*.—Cap 4–5 in. across, globose, then plane, brownish grey, surface irregularly wrinkled and with greyish patches ; gills broad, pure white ; stem 4–6 in. long, stout, bulb depressed, with concentric scales up to the large, torn ring, white.

In woods. Solitary.

*A. spissa*.—Cap 3–4 in. across, convex, then plane, umber, sooty or grey, with small angular, greyish warts ; gills broad, crowded, clear white ; stem 2–3 in. long, bulb depressed, clear white, at length concentrically cracked and squamulose ; ring large. Cap often torn and fibrillose at the edge.

On the ground in woods.

*A. cariosa*.—Cap convex, then plane, soft, even, with irregular mealy patches of the universal veil, up to 4 in. across ; gills adnate, then breaking away and appearing free ; stem stout, 4–5 in. long, fragile, nearly equal, smooth.

In woods.



### PLATE III

1. AMANITA STROBILIFORMIS
2. LEPIOTA GRANULOSA
3. „ EXCORIATA
4. AMANITA RUBESCENS
5. SECTION THROUGH CAP OF FIG. 4, SHOWING CHANGE  
OF COLOUR FROM WHITE TO REDDISH BROWN  
WHEN CUT
6. LEPIOTA HISPIDA



PLATE III.





\*\* *Cap clear yellow or orange.*

*A. aureola*.—Cap 3–4 in. across, globose, then plane, viscid, orange or golden ; gills free, white ; stem 4–5 in. long, with a marginate bulb, floccosely squamulose, white ; ring large.

In woods.

*A. citrina*.—Cap 3–5 in. across, convex, obtuse, bright yellow with white patches ; gills broad, white, free ; stem 4–5 in. long, stout, white ; ring large, volva imperfect.

In woods.

\*\*\* *Cap whitish or greyish.*

*A. nitida*.—Cap about 4 in. across, whitish, with adherent, brownish, angular warts or patches ; gills crowded, broad, clear white ; stem about 3 in. long, stout, conically narrowed upwards, bulbous, squamulose, white ; ring thin, torn, disappearing.

Readily known by the whitish cap with large, hard, thick, angular warts.

In shady woods.

*A. solitaria*.—Cap 3–5 in. across, whitish or with a rufous tinge, with small floccose warts that are easily rubbed off ; gills white ; stem 3–4 in. long, bulb rooting, marginate, scaly below, coloured like the cap ; ring torn.

Known by the scaly stem and rooting bulb.

In damp, shady places on the ground.

*A. strobiliformis* (Pl. III, fig. 1).—Cap 5–8 in. across, white, greyish or yellowish brown, with large angular, pyramidal warts, closely adnate and persistent ; gills broad, whitish ; stem 5–7 in. long, stout, the bulb with 1–2 concentric, marginate rings, whitish, floccosely scaly ; ring large, torn.

Our largest species of *Amanita*, known by the large, hard, pyramidal warts.

Borders of woods, etc. Rare.

*A. echinocephala*.—White. Cap 3–4 in. across, soon plane, bristling with acute, pyramidal warts that fall away ; gills adnexed ; stem scaly, bulbous, rooting ; ring torn.

In woods, etc.

#### AMANITOPSIS

Cap regular ; gills free ; stem central, with a volva ; ring absent.

Intermediate between *Amanita* and *Lepiota*, differing from both in the absence of a ring on the stem.

*A. vaginata* (Pl. II, fig. 3).—Cap 2–5 in. across, soon plane, edge coarsely striate, grey or dull lead-colour ; gills pallid ; stem 4–6 in. long, slightly narrowed upwards, minutely squamulose, pallid, volva loosely sheathing the base of the stem, fragile.

The volva is apt to be overlooked if the fungus is pulled up by the stem.

Among grass in woods, etc. Edible.



var. *nivalis*.—Fungus entirely white, similar in size to the typical grey form.

var. *fulva* (Pl. II, fig. 4).—Cap tawny orange, otherwise as the type form.

*A. strangulata*.—Cap 3–4 in. across, edge striate, rather viscid, livid bay, then pale, usually with numerous warts, the broken-up remains of the volva ; gills crowded, clear white ; stem 4–6 in. long, tapering upwards, pale, volva adnate, broken up into irregular rings, due to the increase in length of the stem.

The cap is sometimes mouse-grey.

In woods.

*A. adnata* (Pl. V, fig. 3).—Cap about 3 in. across, pale yellowish buff, often with woolly patches of the volva ; gills adnate, crowded, white ; stem 2–4 in. long, pale buff, fibrillose, base slightly swollen, volva adnate, white, edge free, sometimes almost obsolete.

An anomalous species in the adnate gills and imperfect volva.

Under oak, holly, etc.

#### LEPIOTA

Cap regular, often scaly or granular ; gills free, usually quite distant from the stem ; stem central ; ring present, sometimes soon disappearing.

Known from *Amanita* by the absence of a volva, and from *Armillaria* by the free gills. *Amanitopsis* differs in the absence of a ring. All the species grow on the ground. Some are edible.

1. *Cuticle of cap dry* (not viscid), *scaly*.

\* *Ring movable from the stem*.

*L. procera* (Parasol Mushroom) (Pl. IV, fig. 1).—Cap 4–9 in. across, soon expanded and umbonate, pale, with darker scales ; gills crowded, whitish ; stem 5–9 in. long, thicker downwards, brownish ; ring large, free, often slipping down the stem.

Among grass in pastures, etc.

*L. rachodes* (Pl. IV, fig. 5).—Much resembling *L. procera*, differing in not being umbonate ; stem whitish, and flesh becoming reddish brown when cut.

Among grass.

*L. leucothites*.—Cap globose, becoming plane, more or less umbonate, becoming broken up into squamules, white, disc tinged brown, 3–4 in. across ; gills free, crowded, tinged pink with age ; stem bulbous, smooth, white ; ring large, persistent.

When old liable to be mistaken for a pink-spored species, unless attention is paid to the smooth, white spores.

On the ground.

*L. prominens*.—Cap globose, then expanded, umbo large and subacute, disc scaly, remainder with scattered, adnate, brown

patches, 3–4 in. across ; gills free, remote from stem ; stem abruptly bulbous, white above, with brown patches below, 6–8 in. long ; ring free.

Differs from *L. procera* in acute umbo, paler stem, etc.

On the ground.

*L. excoriata* (Pl. III, fig. 3).—Cap 2–3 in. across, globose, then expanded, whitish or sometimes tinged brown, even and silky or broken up into scales, more or less peeling towards the edge ; gills soft, white ; stem about 3 in. long, white, almost smooth.

In pastures.

*L. gracilenta* (Pl. V, fig. 1).—Resembling *L. procera*, but smaller and of more slender build. Cap 2–3 in. across, whitish, with brown spot-like scales ; gills very broad ; stem 5–7 in. long, whitish ; ring soon disappearing.

In pastures and woods.

*L. mastoidea*.—Everywhere whitish. Cap 1–1½ in. across, acutely umbonate ; gills very distant from the stem ; stem 2–3 in. high, narrowed upwards from a bulbous base ; ring movable.

In woods.

\*\* *Ring fixed ; stem squamulose up to the ring.*

*L. acutesquamosa*.—Cap 4–5 in. across, convex, very obtuse, pale rusty, rough, with minute brown warts that fall away, leaving scars on the cap ; gills close to the stem ; stem up to 4 in. long, stout, with spirally arranged scales up to the ring.

Differs from *L. friesii* in having acute warts on the cap and in the gills going close up to the stem.

On the ground.

*L. friesii* (Pl. V, fig. 5).—Cap 3–5 in. across, slightly umbonate, yellowish brown, torn into adpressed scales ; gills rather distant from the stem, crowded ; stem 4–5 in. long, somewhat bulbous, colour of cap ; ring large.

In gardens, woods, etc. Smell strong.

*L. badhami*.—Cap 2–4 in. across, flesh like that of the stem, saffron-red when cut, more or less umbonate, sooty brown, velvety or broken up into scales ; gills whitish ; stem 2–4 in. long, bulbous, whitish ; ring firm, rather loose.

Under yews, conifers, etc.

*L. emplastra*.—Cap 2–3 in. across, closely allied to *L. badhami* in the flesh turning brown, etc., differing in the cap being covered with a thin, smooth, dark brown cuticle that becomes broken into patches as the cap expands.

Under conifers.

*L. biornata*.—Cap convex or broadly campanulate, silky, white, sprinkled with minute dark red scales, most numerous at the disc, 1–2 in. across ; gills free, ventricose, white, then tinged yellow ;



## PLATE IV

1. *LEPIOTA PROCERA*, FULLY EXPANDED AND YOUNG
2. SECTION THROUGH CAP OF FIG. 1
3. *LEPIOTA FELINA*
4. „ *CARCHARIAS*
5. „ *RACHODES*
6. SECTION THROUGH CAP OF FIG. 5
7. *LEPIOTA CRISTATA*
8. *CHLOROSPORA EYREI*
9. SECTION THROUGH CAP OF FIG. 8



PLATE IV.





stem slightly ventricose near the base, rooting, white, spotted with red, 3-4 in. long.

In melon and cucumber frames, etc.

*L. meleagris*.—Cap  $\frac{2}{3}$ - $1\frac{1}{2}$  in. across, broken up into minute black scales on a pale ground ; gills whitish ; stem  $1\frac{1}{2}$ -3 in. long, swollen below, with black scales ; ring imperfect.

In hotbeds, greenhouses, etc.

*L. hispida*.—Cap 2-3 in. across, umber-brown, covered with small spreading scales ; gills crowded, white ; stem about 3 in. long, scaly up to the ring.

Woods among pine leaves, etc.

*L. clypcolaria*.—Cap 2-3 in. across, umbo tawny, remainder broken up into soft yellowish tan scales ; gills crowded ; stem about 3 in. high, with spreading yellowish squamules up to the yellowish ring, becoming almost naked when old.

Differs from *L. cristata* in the squamulose stem.

In woods, hot-houses, etc.

*L. felina* (Pl. IV, fig. 3).—Cap 1- $1\frac{1}{2}$  in. across, umbonate, black when young, then broken up into black or brown concentric rings on a white ground ; edge of gills serrulate ; stem about 2 in. long, thickened downwards, white, with black specks ; ring soon disappearing.

Among moss in fir woods.

*L. citriophylla*.—Cap up to  $\frac{3}{4}$  in. across, lemon-yellow, with rufous scales ; gills lemon-yellow ; stem lemon-yellow, squamulose ; ring imperfect or obsolete.

On the ground.

*L. vittadinii*.—Cap 3-4 in. across, altogether whitish, densely covered with small erect scales ; gills with a greenish tinge ; stem  $2\frac{1}{2}$ - $3\frac{1}{2}$  in. long, stout, solid, with concentric rings of scales up to the large ring, whitish or scales tinged red.

In pastures, etc.

*L. nymphaeum*.—Closely allied to *L. vittadinii*, differing more especially in the stem being hollow, and smooth below the ring.

Among grass, etc.

*L. cinnabarina*.—Cap 2-3 in. across, brick-red, scurfy or granular ; gills white ; stem  $1\frac{1}{2}$ -2 in. long, with red scales up to the imperfect ring.

Differs from *L. granulosa* in its larger size and persistently brick-red or red-lead colour.

In pine woods.

var. *terreyi*.—Cap and stem tawny red.

*L. carcharias* (Pl. IV, fig. 4).—Smell strong, unpleasant. Cap  $\frac{3}{4}$ - $1\frac{1}{2}$  in. across, soon plane and more or less umbonate, pale flesh-colour or yellowish pink, granular ; gills clear white, adnexed ;



stem about  $1\frac{1}{2}$  in. long, granular and coloured like the cap up to the ring.

On the ground, often under firs.

*L. granulosa* (Pl. III, fig. 2).—Cap  $\frac{2}{3}$ –1 in. across, expanded and somewhat umbonate, granular, rusty or brownish; gills adnexed, white; stem  $1\frac{1}{2}$ –2 in. long, squamulose and coloured like the cap up to the ring.

Distinguished from *L. cinnabarina* by the adnexed gills and the cap becoming pale; *L. carcharias* differs in the strong smell; and *L. amianthina* is distinguished by the adnate gills and yellow flesh, especially that of the stem.

Woods, heaths, etc.

*L. amianthina* (Pl. I, fig. 2).—Cap  $\frac{1}{2}$ –1 in. across, flesh yellow, as is also that of the stem, umbonate, granular, pale ochre; gills adnate, with a yellow tinge; stem  $1\frac{1}{2}$ –2 in. long, squamulose up to the ring, flesh yellow.

Woods and pastures.

*L. atrocrocea*.—Cap expanded and slightly depressed, bright salmon-orange, more or less covered with dark granules, about  $1\frac{1}{2}$  in. across; gills broadly adnate, white; stem salmon-white or bright salmon-orange, squamulose,  $1\frac{1}{4}$  in. long.

On the ground.

var. *broadwoodiæ*.—Cap yellow, downy; stem and ring mealy.

*L. polysticta*.—Cap about  $1\frac{1}{2}$  in. across, reddish or yellowish brown, usually broken up into minute scales; gills crowded, with a yellowish tinge; stem 1– $1\frac{1}{2}$  in. long, scaly and coloured like the cap up to the ring.

Among short grass by roadsides, etc.

\*\* Stem smooth (not scaly) below the ring, which is sometimes imperfect or obsolete.

*L. metulæspora*.—Cap  $\frac{2}{3}$ –1 in. across, coarsely striate, whitish, with small, pallid scales; gills white; stem 2– $2\frac{1}{2}$  in. long, pale lemon-yellow; ring spreading.

On the ground in shady places.

*L. cristata* (Pl. IV, fig. 7).—Smell strong, unpleasant. Cap  $\frac{3}{4}$ – $1\frac{1}{2}$  in. across, cuticle at first continuous, then broken up into reddish brown, smooth patches, concentrically arranged on a whitish ground; gills pallid; stem about 2 in. long, whitish; ring soon disappearing.

In fields, etc.

*L. serena*.—Entirely white. Cap campanulate, smooth, disc sometimes tinged with colour, about 1 in. across; gills rather remote from the stem; stem about  $1\frac{1}{2}$  in. long, sub-bulbous, slender; ring deciduous.

Among grass.

*L. nigromarginata*.—Cap campanulate, then expanded, sub-umbonate, with umber scales on a pale brown ground,  $\frac{1}{2}$ –1 in. across; stem hollow, tapering upwards, smooth, pinky white; ring distant, persistent; gills whitish, edge bordered with dark brown.

Among grass.

*L. erminea*.—White. Cap 2–3 in. across, edge fibrillose; gills obtuse at both ends; stem about 3 in. long; ring soon disappearing.

Among grass, etc.

*L. micropholis*.—Cap about  $\frac{1}{2}$  in. across, white, clad with minute, radiating, dark grey or blackish scales; gills crowded; stem up to 1 in. long, curved, white; ring spreading.

On cocoanut fibre in a stove.

*L. holosericea*.—Cap 3–4 in. across, fibrillose, whitish or with a tinge of tan, edge inturned when young; gills broad, crowded; stem  $2\frac{1}{2}$ –4 in. long, solid, base bulbous, whitish; ring large, soft.

In gardens, etc.

*L. naucina*.—White. Cap 2–4 in. across, globose, then expanded and somewhat umbonate; gills narrow in front or near the edge; stem about 2 in. long, base swollen, imperfectly hollow; ring thin, often soon disappearing.

Resembling *L. excoriata* in general appearance, differing in the thin ring.

In fields, cucumber frames, etc.

*L. cepæstipes* (Pl. V, fig. 2).—Cap 1–3 in. across, thin, umbonate, minutely scaly, sulphur-yellow, sometimes white, disc often brownish, edge plicate; gills with a yellow tinge; stem 3–6 in. long, thin above, swollen below, floccose, whitish or pale yellow, hollow; ring small.

On tan in hot-houses, melon beds, etc.

*L. licmophora*.—Entirely pale lemon-colour. Very closely allied to *L. cepæstipes*, of which it is probably only a variety, differing in having the cap perfectly smooth and coarsely grooved up to the disc.

On soil in hot-houses, etc.

*L. sistrata*.—Cap  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, whitish, disc often darker, tinged yellow or flesh-colour, primrose with shining particles; gills white, crowded; stem  $1\frac{1}{2}$ –2 in. long, white; ring torn and attached in fragments to the edge of the cap.

Among grass, in gardens, etc.

*L. parvannulata*.—Cap up to  $\frac{1}{2}$  in. across, umbonate, white with a yellow tinge; gills crowded, white; stem 1–2 in. long, slender, slightly wavy, white; ring small, spreading.

*L. erminea* differs in the radishy smell.

In pastures, etc.



## PLATE V

1. LEPIOTA GRACILENTA
2. „ CEPÆSTIPES
3. AMANITOPSIS STRANGULATA
4. SECTION OF CAP OF FIG. 3
5. LEPIOTA FRIESII
6. SECTION OF CAP OF FIG. 5



PLATE V





*L. mesomorpha*.—Cap about  $\frac{3}{4}$  in. across, smooth, yellowish or pale brown ; gills clear white ; stem  $1-1\frac{1}{2}$  in. long, smooth, paler than the cap ; ring erect, persistent, whitish.

Distinguished by the entire, erect ring, and the even and glabrous cap and stem.

On the ground among grass, moss, etc.

*L. seminuda*.—Cap about 1 in. across, umbonate, mealy, then naked, whitish or flesh-colour, often fringed with the torn veil ; gills white ; stem 1–2 in. long, white, mealy ; ring small, imperfect.

In woods, etc.

*L. bucknalli*.—Smell strong, resembling gas-tar. Cap  $\frac{1}{2}-\frac{3}{4}$  in. across, white, sprinkled with lilac powder ; gills white ; stem  $1\frac{1}{2}-3$  in. long, white, the lower half sprinkled with violet powder.

On the ground.

*L. ianthina*.—Cap about  $\frac{3}{4}$  in. across, umbonate, whitish at the even edge, disc dark violet, the rest with radiating, violet hair-like squamules ; gills lanceolate ; stem about 1 in. long, rather wavy, whitish ; ring narrow, deciduous.

In stoves.

*L. martialis*.—Cap campanulate, then plane, minutely silky, clear pink, disc darkest, up to 1 in. across ; gills rather crowded, whitish ; stem about  $1\frac{1}{2}$  in. long, pinkish below the ring.

On the trunk of a tree-fern.

2. *Cuticle of cap viscid, not at all broken up.*

*L. medullata*.—Smell resembling radishes. Every part pure white. Cap  $1\frac{1}{2}-2\frac{1}{2}$  in. across ; gills crowded ; stem  $2\frac{1}{2}-3$  in. long ; ring incomplete. Differs from *L. illinita* in the dry stem.

On the ground in woods, etc.

*L. delicata*.—Cap about 1 in. across, umbonate, granular, rufescent [or yellowish ;] gills crowded, pure white ; stem about 1 in. long, whitish, downy ; ring entire, dry.

Differs from *L. glioderma* in smaller size, and stem not scaly.

In woods, hot-houses, etc.

*L. illinita*.—Cap 2–3 in. across, somewhat umbonate, clear white or tinged tan ; gills crowded, remote from the stem ; stem 2–3 in. long, white, glutinous ; ring obsolete.

In woods.

*L. glioderma* (Pl. I, fig. 6).—Cap 1–2 in. across, reddish bay or yellowish brown ; gills pure white ; stem whitish, covered with floccose scales up to the imperfect ring.

In pine woods, etc.

*L. lenticularis*.—Cap 3–4 in. across, tan-colour with a tinge of red ; gills closely crowded, white ; stem 4–6 in. high, solid, pale ; ring large.

In damp woods.



*L. georginæ*.—Cap campanulate, then plane, viscidly mealy, white, instantly changing to red when touched,  $\frac{1}{2}$ –1 in. across; gills white, the edge becoming crimson when touched; stem 1–2 in. long, white, crimson when touched.

Remarkable for changing to crimson or blood-red when bruised.

At first found on mosses in a cool fernery, but has since been collected in woods, and may be considered as truly indigenous.

#### SCHULZERIA

Cap regular, somewhat fleshy; gills free from the stem; stem central; ring and volva entirely absent from the first; spores colourless.

Closely allied to *Lepiota*, differing in the absence of a ring. Care must be taken not to confound species of *Lepiota*, in which the ring falls away at an early stage of development, with members of the present genus.

A very fine species belonging to this genus, almost rivalling *Lepiota procera* in size, is common in Natal, which is said to be delicious when cooked, and much superior to the common mushroom. It is called *S. umkowaani*, after its native name.

*S. lycoperdioides*.—Cap convex, then expanded, soft, chestnut-colour, densely covered with pyramidal warts, edge with fragments of the veil, 1–1½ in. across; gills free, somewhat crowded, white; stem about 2 in. long, equal, solid, fibrillose, whitish.

The cap bristles with pyramidal warts, which are often split at the base, as in some species of *Lycoperdon*.

On the ground under cedars, etc.

*S. wynnica*.—Cap  $\frac{2}{3}$ –1½ in. across, exceedingly thin, campanulate, then plane, with a trace of an umbo, striate, pulverulent, whitish, disc more or less tinged with brown; gills free or very slightly adnexed at first, rather distant, about 1 line broad, white; stem about 1½ in. long, slender, slightly striate, hollow, whitish.

Undoubtedly an introduced species, and in all probability an Australian plant, as I have seen specimens from Queensland that agree exactly with the type specimens. In Queensland it is said to be luminous, emitting a greenish light.

In a stove, Kew Gardens.

*S. grangei*.—Cap dark green, cracking into fibrous scales on a white ground, flatly umbonate, 1–1½ in. across; gills widest in front, minutely denticulate; stem scaly, scales tipped green.

On soil among beech leaves.

#### ARMILLARIA

Cap symmetrical; gills attached to the stem; stem central, with a distinct ring.

The principal marked features of the present genus are the

presence of a ring on the stem, along with gills attached to the stem.

\* *Gills sinuately adnexed ; ring present (resembling Tricholoma with a ring).*

*A. bulbigera*.—Cap 3–4 in. across, convex, then expanded, brownish or yellowish red ; gills broadly sinuate, becoming coloured ; stem 2–3 in. long, stout, with a distinctly marginate bulb, pale with blackish fibrils ; ring soon disappearing.

Readily distinguished by the marginate bulb at the base of the stem.

On the ground in pine woods.

*A. focalis*.—Cap 3–5 in. across, convex, then expanded, obtuse, rather shining, reddish tawny ; gills crowded, narrow ; stem about 3 in. long, stout, pale tawny, fibrillose, solid, not at all bulbous ; ring large, oblique.

On the ground in pine woods.

var. *goliath*.—Much larger ; ring fugacious.

*A. robusta*.—Cap up to 3 in. across, dry, rufous-bay, flesh thick ; gills broad, crowded, whitish ; stem 1–2 in. long, stout, reddish white, fibrillose below the large ring.

var. *minor*.—Smaller than type form ; gills very narrow.

Both occur in woods.

*A. aurantia*.—Cap 2–3 in. across, convex, then almost plane, deep orange ; gills white, then tinged rufous ; stem about 3 in. long, stout, tawny orange, with concentric rings of squamules up to the obsolete ring, shining white above.

In pine woods.

*A. caligata*.—Smell strong. Cap convex, then plane, tawny, with adpressed, silky squamules, 3 in. across ; gills emarginate, white ; stem solid, below the ring zoned with brown squamules, 3–4 in. long.

Previously called *A. focalis*, var. *minor*.

On the ground in pine woods, etc.

*A. ramentacea* (Pl. VI, fig. 5).—Cap 2–3 in. across, becoming almost flat, then depressed and upturned, whitish or tinged yellow, broken up into darker adpressed scales ; gills becoming free, white, then yellowish ; stem 1–2 in. long, variegated with brown squamules up to the imperfect ring, white above.

Smell unpleasant. Requires to be carefully distinguished from *Lepiota carcharias*.

On the ground under pines, etc.

*A. hæmatites* (Pl. VI, fig. 4).—Cap about 1 in. across, liver-coloured ; gills narrow, with a reddish tinge ; stem coloured like the cap up to the spongy ring, whitish above.

Among fir leaves.



## PLATE VI

1. ARMILLARIA MUCIDA
2. „ MELLEA
3. SECTION OF CAP OF FIG. 2
4. ARMILLARIA HÆMATITES
5. „ RAMENTACEA



PLATE VI.





*A. constricta*.—Entirely white. Cap about 2 in. across, smooth ; gills almost free, narrow ; stem  $1\frac{1}{2}$ –2 in. long, fibrillose ; ring narrow.

Among grass in sunny places, especially where it has been scorched by urine.

\*\*\* *Gills more or less decurrent. Resembling Clitocybe, but with a ring.*

*A. mellea* (Pl. VI, fig. 2).—Tufted. Cap 2–5 in. across, convex, then expanded, very variable, usually ochraceous with a tinge of honey-colour, sprinkled over with small dark-spreading scales, sometimes sooty or covered with olive down when young ; gills slightly decurrent, white, with a dingy pink tinge ; stem 3–5 in. long, dingy ochraceous, floccose below the ring, base usually honey-colour.

One of the commonest and at the same time the most variable of fungi ; usually densely tufted, but sometimes solitary and large. A destructive tree parasite.

At the base of trunks or on the ground.

*A. subcava* (Pl. VIII, fig. 6).—Cap  $1$ – $1\frac{1}{2}$  in. across, expanded, striate to the middle, viscid, umbonate, white except the umbo, which is brownish ; gills decurrent, white ; stem about 2 in. long, white ; ring torn.

On the ground in pine woods.

*A. mucida* (Pl. VI, fig. 1).—Cap up to 3 in. across, hemispherical, then expanded, very glutinous, often wrinkled, whitish or tinged grey ; gills broad, distant, white ; stem  $1\frac{1}{2}$ –4 in. long, curved, smooth, white, but often with sooty squamules at the base ; ring thick.

Readily known by the glutinous cap, usually white, but sometimes sooty or olive-brown.

On dead and living beech trunks. Usually tufted.

*A. citri*.—Cap about 1 in. across, rather umbonate, sulphur-yellow, becoming whitish ; gills narrow, crowded, white ; stem 2–3 in. long, whitish ; ring large, spreading.

On stumps. Tufted.

*A. jasonis*.—Cap 1–2 in. across, expanded, with a distinct rounded umbo, granular, golden-yellow, tinged tawny at the disc ; veil in fragments at edge of cap ; gills white, then pallid ; stem 2–3 in. long, coloured like the cap, squamulose up to the torn, spreading ring.

On stumps.

*A. denigrata*.—Cap 1–2 in. or more across, becoming plane, dark brown, minutely warted ; gills pale brown, then darker ; stem up to 2 in. long, fibrous, pale brown ; ring narrow, soon falling away.

On the ground in damp places.



## TRICHOLOMA

Cap fleshy, convex, rarely umbonate or depressed; stem central, stout, externally longitudinally fibrous; gills sinuate, often becoming spotted with rusty stains, white, yellow, or grey.

All the species grow on the ground, and are usually large, fleshy, and robust. Certain species of *Pleurotus* somewhat resembling *Tricholoma* are distinguished by growing on wood. *Collybia* differs in the smooth, polished, and not fibrous stem. Some are edible.

1. *Pilens glutinous* or viscid when moist, squamulose or fibrillose.

\* Gills not becoming spotted with brown.

*T. equestre*.—Cap 3–6 in. across, convex, then expanded, often wavy, viscid, squamulose, yellow with rufous tinge; gills sulphur-yellow; stem stout, base more or less thickened, whitish or yellow, solid.

In fir woods on the ground.

*T. sejunctum*.—Cap 3–4 in. across, gibbous, bright yellow, with brown fibrils; gills pure white; stem 4–5 in. long, stout, white.

Smell strong, like meal, taste bitter. Differs from *T. equestre* in white gills.

On the ground in woods, especially of conifers.

*T. portentosum*.—Cap 3–5 in. across, expanded, often wavy, sooty, with a purple tinge, streaked with fine black lines; gills very broad, pallid; stem stout, whitish, about 3 in. long.

Distinguished by the viscid, dusky cap with fine, black, radiating streaks.

*T. fucatum*.—Cap 2–3 in. across, soon plane, often wavy, lurid yellow with darker stains, disc darkest; gills crowded, whitish or tinged yellow; stem 2–3 in. long, soft, fibrillosely squamulose, whitish or tinged yellow.

Differs from *T. portentosum* in absence of black streaks on the cap.

On the ground in woods, especially coniferous.

*T. quinquepartitum*.—White. Cap 3–4 in. across, fragile, expanded, often wavy, smooth; gills about  $\frac{1}{2}$  in. broad; stem 3–4 in. long, usually narrowed downwards, striate, smooth, solid.

Smell none. Sometimes confounded with white forms of *T. portentosum* and *T. fucatum*; differing from the former in the absence of streaks on the cap, and from the latter by the smooth, striate stem.

In pine woods, etc.

*T. spermaticum*.—White, smell strong, unpleasant. Cap 2–3 in. across, rather thin, becoming expanded and wavy, smooth, shining when dry; gills rather distant, about 3 lines broad, edge uneven; stem 2–3 $\frac{1}{2}$  in. across, twisted, becoming hollow.

Distinguished among the white, strong-smelling species by the stout, twisted, hollow stem.

In pine woods.

*T. resplendens*.—Entirely clear white. Cap 2–4 in. across, convex, then expanded, smooth, silvery, shining when dry, and often with hyaline drop-like spots, disc sometimes yellowish; gills rather crowded, edge entire; stem 2–3 in. long, equal or bulbous, smooth, sometimes curved.

Gregarious, entirely white, or disc yellowish; smell and taste pleasant. Resembling *Hygrophorus eburneus* in habit and size.

On the ground in woods.

\*\* *Gills becoming discoloured, usually spotted or stained with reddish brown.*

*T. colossus*.—Cap 5–8 in. across, convex, then expanded, smooth at first, becoming broken up into squamules, edge strongly incurved at first, then straight or upturned, brick-red or reddish umber, flesh 2 in. and more thick, hard, red when broken; gills crowded, broad, white, then pale brick-red; stem 3–4 in. long, stout, colour of cap, narrowed at the apex.

Known by its large size and by the flesh turning red when broken. Smell none.

In pine woods.

*T. acerbum*.—Taste bitter. Cap 3–4 in. across, soon almost plane, edge strongly incurved at first, whitish, then tinged red or yellow; gills rather narrow, creamy, then tinged rufous; stem 2–3 in. long, pale, apex squamulose.

Known by scaly apex of stem, rusty gills, and bitter taste.

In woods.

*T. nictitans*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, expanded, yellowish, disc darker; gills crowded, yellow, with reddish spots when old; stem about 3 in. long, apex slightly scaly, pale yellow.

Inodorous. Taste pleasant.

In woods.

*T. fulvellum*.—Cap 1–2 in. across, soon plane, even, yellowish, rufescent or tan-colour, disc darker and wrinkled; gills crowded, white, then rufescent; stem 2–3 in. long, slender, fibrillose, apex naked, becoming hollow.

Inodorous. Differs from *T. nictitans* in the naked apex of the stem.

In woods.

*T. flavobrunneum* (Pl. VII, fig. 4).—Cap 3–6 in. across, soon expanded, gibbous, tawny rufous or bay, with adpressed squamules or streaks, surface not broken up; gills crowded, pale yellow, soon spotted brown; stem 3–5 in. long, stout, brownish, generally narrowed at each end, flesh yellow.



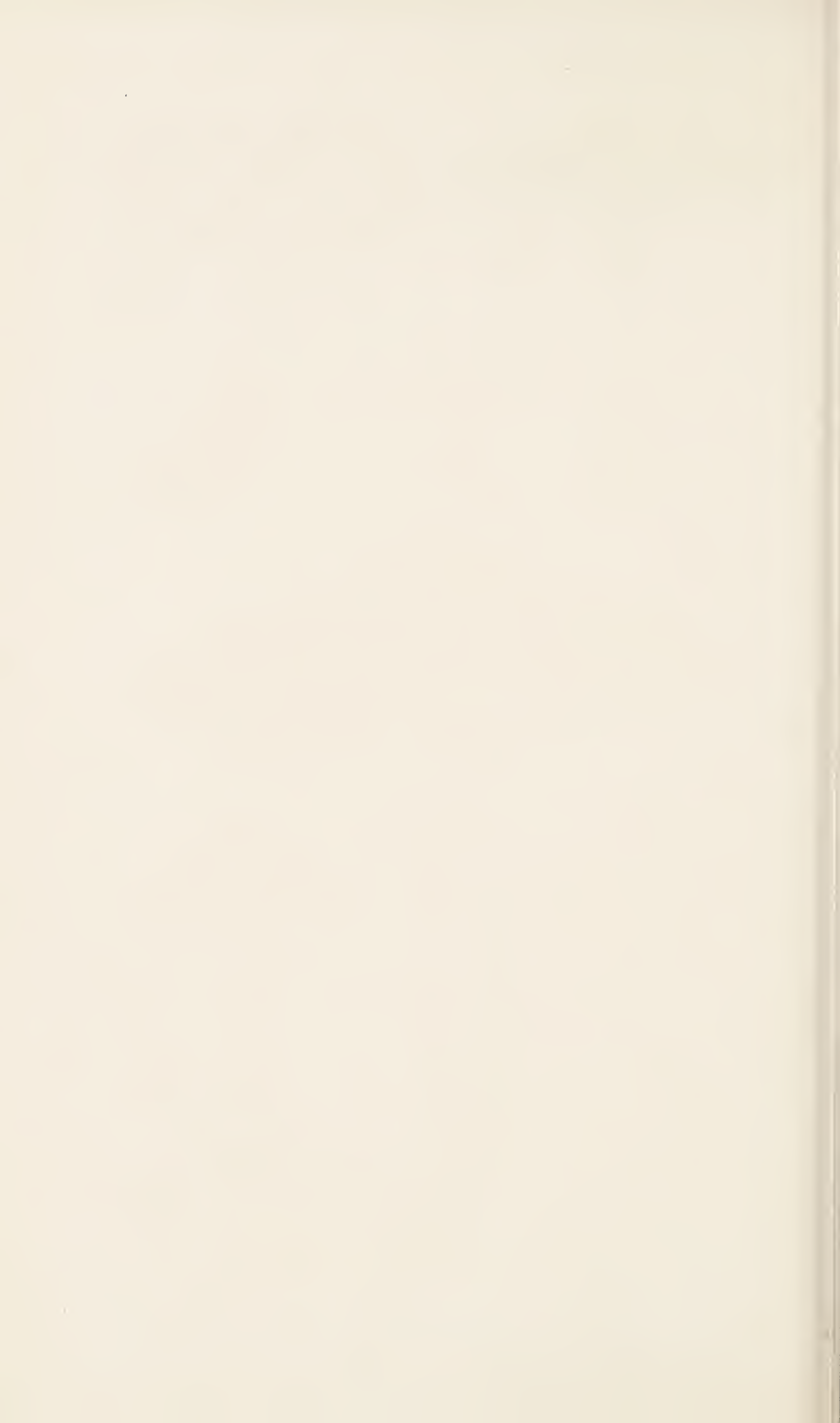
## PLATE VII

1. TRICHOLOMA MELALEUCUM
2.       ,,       RUTILANS
3. SECTION OF CAP OF FIG. 2
4. TRICHOLOMA FLAVOBRUNNEUM
5. SECTION OF CAP OF FIG. 4
6. TRICHOLOMA SULFUREUM



PLATE VII.





Distinguished by strong smell of new meal and yellow flesh of stem. Flesh of cap also more or less yellow.

In woods, etc.

*T. albobrunneum*.—Closely resembling *T. flavobrunneum* superficially, differing in the absence of smell and perfectly white flesh.

In pine woods, etc.

*T. ustale*.—Cap 2–3 in. across, expanded and umbonate, becoming almost plane and obtuse, even, smooth, bay-brown; gills white, then tinged rufous; stem 2–3 in. long, becoming hollow, rooting, fibrillose, whitish.

Allied to *T. flavobrunneum* and *T. pessundatum*; differing from both in the absence of smell.

In woods.

*T. pessundatum*.—Smell strong of new meal. Cap about 3 in. across, expanded, wavy, smooth, bay or reddish, paler towards the smooth edge, which is incurved; gills cut out behind, white, then reddish; stem 2–3 in. long, stout, almost smooth, white, bulb-like, then elongating.

In pine woods.

*T. stans*.—Cap 3–4 in. across, convex, then expanded, even, viscid, rufescent; gills white, stained reddish brown; stem 2–3 in. long, stout, whitish with a rufescent tinge, squamulose.

Flesh reddish under the cuticle. Often very viscid.

On the ground among heather, etc.

*T. russula*.—Cap about 3 in. across, granulated, rosy flesh-colour, sometimes very deeply tinted; gills pure white, becoming slightly spotted; stem 1½–2 in. long, white, more or less tinged rose-colour.

Commonly confused with *Hygrophorus pudorinus* and *H. erubescens*; differing from both in the granulated or corrugated cap, flesh tinged rose-colour under the cuticle, and in not growing in pine woods. Edible.

Among grass under trees.

*T. frumentaceum*.—Cap 2–4 in. across, expanded, smooth, pallid, with a red tinge and streaked with darker lines; gills crowded, white, then reddish; stem 2½–3 in. long, solid, fibrillose, whitish, more or less variegated with pale red. Smell like meal.

On the ground, often in the open.

2. Cap dry (never glutinous nor viscid).

\* Gills not discoloured nor spotted.

*T. rutilans* (Pl. VII, fig. 2).—Cap 3–6 in. across, expanded, entirely covered with dark purple or reddish brown velvety down; flesh yellow, deeper in colour when broken; gills yellow, edge deeper in colour, thickened, downy; stem 2–3 in. long, yellow, more or less variegated with purplish squamules.

Cap variable, sometimes all purple, at others the purple nap is



broken up into squamules, showing the yellow flesh. Readily distinguished by the deep yellow flesh and yellow gills, with the downy edge orange-colour.

On wood and stumps, etc., in pine woods, etc.

*T. variegatum*.—Closely resembling *T. rutilans* in general appearance, but recognized by the paler yellow colour of the flesh and gills, and more especially by the edge of the gills being quite sharp, and not more deeply coloured than the remainder.

On rotten wood.

*T. luridum*.—Cap  $1\frac{1}{2}$ –3 in. across, flesh rather thin, convex, then plane, rather wavy, deformed, dry, cuticle cracking, yellow or yellowish grey; gills broad, closely crowded, whitish; stem 2–3 in. long, stout, unequal, smooth, white.

More or less resembling *T. saponaceum* and *T. portentosum*, differing in smell of new meal.

In dry pine woods.

*T. guttatum*.—Cap convex, then expanded, cinnamon or with a pinkish tinge, broken up into granular or floccose innate scales, edge remotely sulcate, incurved, and downy at first; gills running in lines down the stem, crowded, snow-white; stem 2–3 in. long, white, mealy, solid.

Differs from *T. tigrinum* in persistently white gills and sulcate edge of cap.

Borders of woods, etc.

*T. columbetta*.—Entirely pure white, becoming spotted with red here and there. Cap 2–4 in. across, convex, then expanded, wavy, dry, even, then broken up into squamules, edge incurved and downy when young; gills almost free, pure white; stem 3–4 in. long.

Solitary, inodorous, taste mild.

In woods.

*T. sculpturatum*.—Cap 2–3 in. across, first conical, then expanded, covered with thick down at first, then breaking up into umber or rufous scales on a yellowish ground; gills white, then yellowish; stem 2–3 in. long, whitish, fibrillose.

Covered with floccose down at first, then breaking up into large scales on a yellowish white ground. Allied to *T. terreum*, which differs in having greyish gills.

In woods on the ground.

The following varieties are recognized:

var. *argyraceus*.—Slenderer than typical form; cap white and silvery; gills crowded, whitish.

var. *chrysites*.—About size of typical form, pale; cap and gills becoming yellowish.

var. *virescens*.—Resembling typical form in size and colour, becoming yellowish green when bruised or during drying.

**\*\* Gills becoming tinged red or grey, edge often spotted.**

*T. vaccinum*.—Cap campanulate, then expanded, umbonate, becoming broken up into small spreading scales, or torn into adpressed scales, dry, rufous, 3–5 in. across, flesh thick and, like that of the stem, white, then reddish; gills rather distant, broad, whitish, then spotted and rufescent; stem hollow, more or less corticated, whitish with a rufescent tinge, about 3 in. long.

Differs from *T. imbricatum* in the umbonate cap, and hollow stem with the apex quite naked.

In pine woods, etc.

*T. imbricatum*.—Closely resembling *T. vaccinum* in size, colour, and general appearance. Differing in the cap not being at all umbonate, and in the stem being solid and having the apex covered with white, pulverulent down.

In pine and mixed woods.

*T. immundum*.—Cap rather fleshy at disc, edge incurved and very thin, when dry dingy white with darker stains, 2–3 in. across; gills grey with pink tinge; stem dingy white, fibrillose, about 2 in. long.

Known by the dark gills and thin cap. The gills separate readily from the cap, as in *Paxillus*. Every part of the fungus becomes black when bruised.

Among short grass in pastures.

*T. inodermium*.—Cap conico-campanulate, acute, then more convex and somewhat umbonate, becoming broken up into fibrils, etc., rufous-brown, 1–2 in. across; gills very broad and ventricose, white, spotted reddish when bruised; stem white with a rufous tinge, hollow upwards, about 3 in. long.

In damp, dense pine woods.

*T. hordum*.—Cap campanulate, then expanded, at length flattened, somewhat umbonate, and the edge becomes upturned, unequal, wavy, smooth, surface soon cracking or breaking up into scales, grey, about 3 in. across; gills broad, rather distant, white, then greyish; stem smooth, whitish, about 3 in. long.

Inodorous, mild, rigid, and fragile.

Under beeches, etc.

*T. murinaceum*.—Cap 2–3 in. across, more or less umbonate, silky, grey, sometimes cracked into scales; gills broad, distant, grey; stem pale grey, with darker minute scales.

Differs from *T. terreum* in squamulose stem.

In woods.

*T. terreum* (Pl. VIII, fig. 1).—Cap 2–3 in. across, umbonate, squamulose, bluish grey; gills pale grey, edge minutely jagged; stem fibrillose, whitish, 1–3 in. long.

In woods.

var. *orirubens*.—Edge of gills rose-colour.

var. *atrosquamosus*.—Cap grey, covered with small black scales.



*T. horrible*.—Cap convex, then expanded, densely covered with dark brown squamules, becoming squarrose at the disc, the entire cap tinged with pink below the squamules at maturity, 3–5 in. across ; gills emarginate, crowded, whitish, tinged pink with age, edge uneven ; stem white, hollow, smooth, base thickened, stout, 3–4 in. long (spores globose, 5 in. diam.).

Known by every part, except outside of stem, becoming pinkish with age, and by the presence of brown spots in flesh of stem and cap.

Under beech trees.

*T. squarrulosum*.—Cap fleshy, convex, then expanded, brown, densely covered with blackish squamules ; gills sinuato-adnexed, crowded, grey ; stem densely covered with blackish brown squamules.

Under oaks and hazels.

3. *Skin of cap rigid, granulated or broken up into small squamules when dry, not viscid ; floccosely scaly, not torn into fibrils. Smell often strong.*

\* *Gills white or pallid, not spotted.*

*T. macrorrhizum*.—Smell strong, unpleasant. Cap convex, then expanded or depressed, smooth, then cracking, ochraceous, darker when old, 5–8 in. across ; gills almost free, broad, pallid ; stem stout, ventricose, whitish, tinged ochraceous below, 2–3 in. long, ending in a long, rooting base.

Among grass under oaks, etc.

*T. saponaceum*.—Strong scented. Cap convex, then expanded, obtuse, often irregular, dry, smooth or cracked, livid brown, often with an olive tinge, 2–4 in. across ; gills thin, distant, pallid, with a tinge of green ; stem whitish, smooth or squamulose, somewhat rooting, 2–4 in. long.

Smell soapy. Flesh turning reddish when broken.

In woods.

*T. cartilagineum*.—Cap convex, edge incurved, then expanded and wavy, but edge persistently incurved, dry, densely covered with minute black granules on a white ground, 2–3½ in. across ; gills crowded, white, then grey ; stem hollow, short and firm, pure white, polished, 1–2 in. long.

Cartilaginous when young, fragile when old.

Among grass in pine woods.

*T. tenuiceps*.—Flesh thin. Cap convex or slightly gibbous, dry, granular, sooty brown, 2–3 in. across ; gills ventricose, white ; stem ochraceous-white, minutely granular, base with spreading, cord-like mycelium.

Solitary or in small clusters.

Among grass under trees.

*T. loricatum*.—Smell strong, unpleasant. Cap tough, campanu-



late, then convex and wavy, papillose, cuticle horny and separable, brown, edge paler, 1-2 in. across; gills closely crowded, whitish straw-colour; stem tough, often twisted, brownish red, 2-3 in. long.

Tough. Remarkable for the horny, separable cuticle.

In woods.

*T. compactum*.—Cap spongy, very fleshy, expanded, even, very smooth, livid grey, 3-4 in. across; gills rather distant, yellow; stem smooth, white, stout, 1½-2 in. long.

In woods.

*T. atrocinereum*.—Cap convex, then plane, smooth, dry, opaque, grey, disc darker, often cracked or broken up into scales, 1½-2 in. across; gills thin, crowded, white; stem cylindrical, smooth, whitish, 2-3 in. long.

Smell strong of new meal.

Among grass.

*T. cuneifolium*.—Smell strong, like meal. Cap convex, then plane, dry, smooth, soon broken up into squamules, brown, edge often upturned and splitting, about 1 in. across; gills broad and obliquely truncate, thin, crowded, white; stem hollow, narrowed at the base, pallid, apex mealy, up to 1 in. long.

Differs from *T. atrocinereum* in the hollow stem, narrowed downwards, and in its shorter length.

Among grass in open places, also in woods.

**\*\* Gills discoloured, spotted with rufous or grey.**

*T. crassifolium*.—Strong scented. Cap campanulate, then expanded and wavy, umbonate, ochraceous, 2-4 in. across; gills nearly free, thick, becoming yellowish and stained brown; stem solid, paler than the cap, pruinose, 1-1½ in. long.

Recognized by the strong smell, ochraceous cap, and thick gills, which are unusual in *Tricholoma*.

In fir woods.

*T. tumidum*.—Cap deformed, inflated, then expanded and wavy, at length cracking, edge more or less lobed and incurved at first, livid grey, spotted, rather shining when dry, about 3 in. across; gills broad, rather distant, pure white, then grey with a rufous tinge; stem stout, striate, white, often rooting, about 3 in. long.

In pine woods, etc.

*T. sudum*.—Cap convex, then plane or upturned, dry, broken up into scales, rufous or brownish rufous, 2-3 in. across; gills deeply emarginate or cut out behind, crowded, whitish, edge rufescent; stem slightly thinner upwards, punctate with minute squamules, pallid or tinged rufous, about 3 in. long.

Somewhat resembling *T. arcuatum*, which differs in the bulbous stem. Gills sometimes tinged grey.

Among grass in woods, etc.

*T. virgatum*.—Cap 2–3 in. across, expanded and somewhat umbonate, dry, smooth, even, greyish, and streaked with fine black lines, umbo darker, squamulose; gills broad, crowded, becoming greyish; stem about 3 in. long, whitish.

The only *Tricholoma* with a perfectly dry, finely streaked cap. In pine woods, etc.

4. Cap slightly silky at first, soon almost smooth, dry, not distinctly scaly.

\* Gills broad, rather distant. Strong scented.

*T. sulfureum* (Pl. VII, fig. 6). Smell strong and very unpleasant. Entirely sulphur-yellow; cap 1–3 in. across; stem 2–4 in. long.

In woods.

*T. opicum*.—Cap convex, then expanded, obtusely umbonate, becoming upturned and splitting, often minutely squamulose, grey, 1–1½ in. across; gills broadly emarginate, hoary; stem fibrillose, pallid or greyish, 2–3 in. long.

Inodorous. Somewhat resembling *T. saponaceum*, but differs in the absence of smell.

Among moss in pine woods, etc.

*T. bufonium*.—Cap 1½–2½ in. across, becoming almost plane, somewhat gibbous, corrugated, purplish brown to blackish umber; gills yellowish tan-colour, then pallid; stem 2–3 in. long, flocculose, coloured like the cap.

Distinguished by the tan-coloured gills and flocculose or downy stem.

In pine woods.

*T. lascivum*.—Smell strong, foetid. Cap convex, then plane, at length depressed, slightly silky, dry, tan-colour, then pallid, about 2 in. across; gills arcuately decurrent, thin and crowded; stem entirely fibrous, fibrillose, whitish, apex with white meal, base rooting, about 2 in. long.

In mixed woods.

var. *robustus*.—More robust than the type. Cap almost white, silky. Smell scarcely evident.

In woods.

*T. inamœnum*.—Foetid. Cap convex, then expanded, rather umbonate, very dry, slightly silky, then smooth, dingy white, 1–2½ in. across; gills very broad and very distant, pure white; stem almost smooth, white, solid, often rooting, 3–4 in. long.

Our only white *Tricholoma* with a very foetid smell, which is much stronger and more unpleasant than that of *T. sulfureum*.

In pine woods, etc.

\*\* Gills thin, crowded, narrow; small. Inodorous.

*T. cerinum*.—Cap 1–1½ in. across, convex, then depressed,



opaque, dry, smooth, dingy wax-colour or brownish; gills thin and crowded, dark yellow or wax-colour; stem about 1 in. long, fibrillosely striate, yellow.

In dry pine woods.

*T. fallax*.—Cap convex, then expanded, moist, smooth, yellow, disc sometimes rufous, about 1 in. across; gills crowded, white, then yellowish; stem pale yellow, about 1 in. long.

Distinguished among the small species of *Tricholoma* by the clear, but pale yellow cap and stem, and the yellowish gills.

Under firs.

*T. ionides*.—Cap campanulate, then convex, at length plane, umbonate, almost smooth, usually dingy violet, becoming pale, 1–2 in. across; gills crowded, white, then pallid; stem coloured like the cap, often curved at the base, 1–1½ in. long.

Cap violet, lilac, or brownish purple, differs from *T. humile* and *T. sordidum* in the white gills.

In woods.

var. *parvus*.—Cap reddish brown.

In greenhouses.

*T. carneolum*.—Cap hemispherical, then convexo-plane or slightly depressed, obtuse, even, flesh-colour or rosy, becoming pale, ¾–1 in. across; gills very broad and rounded behind, much crowded, white; stem rather tough, rigid, slightly pruinose, pale, about 1 in. long.

Among short grass.

*T. carneum* (Pl. VIII, fig. 5).—Cap expanded, obtuse, smooth, fragile, persistently reddish flesh-colour, up to 1 in. across; gills pure white; stem coloured like the cap, not losing its colour, about 1 in. long.

*T. carneolum* differs in having the gills very broad behind, in the pale stem, and in the cap losing its colour.

Among short grass in open pastures, etc. Often more or less tufted or clustered.

*T. cælatum*.—Cap up to 1 in. across, centre depressed, smooth and brown when growing, flocculose and grey when dry; gills dingy white or greyish; stem about 1 in. long, brown.

Known by small size and depressed cap.

On the ground, especially on scorched places.

5. Cap fleshy, soft, fragile, often marked with drop-like spots, or rivulose; stem solid. Mostly appearing in the spring; tufted, or growing in troops or circles.

\* Gills whitish.

*T. gambosum* (Pl. VIII, fig. 2).—Cap hemispherical, then convex, at length expanded, obtuse, wavy, even, smooth, but marked with drop-like spots, at length cracking, pallid tan, edge incurved, 3–5



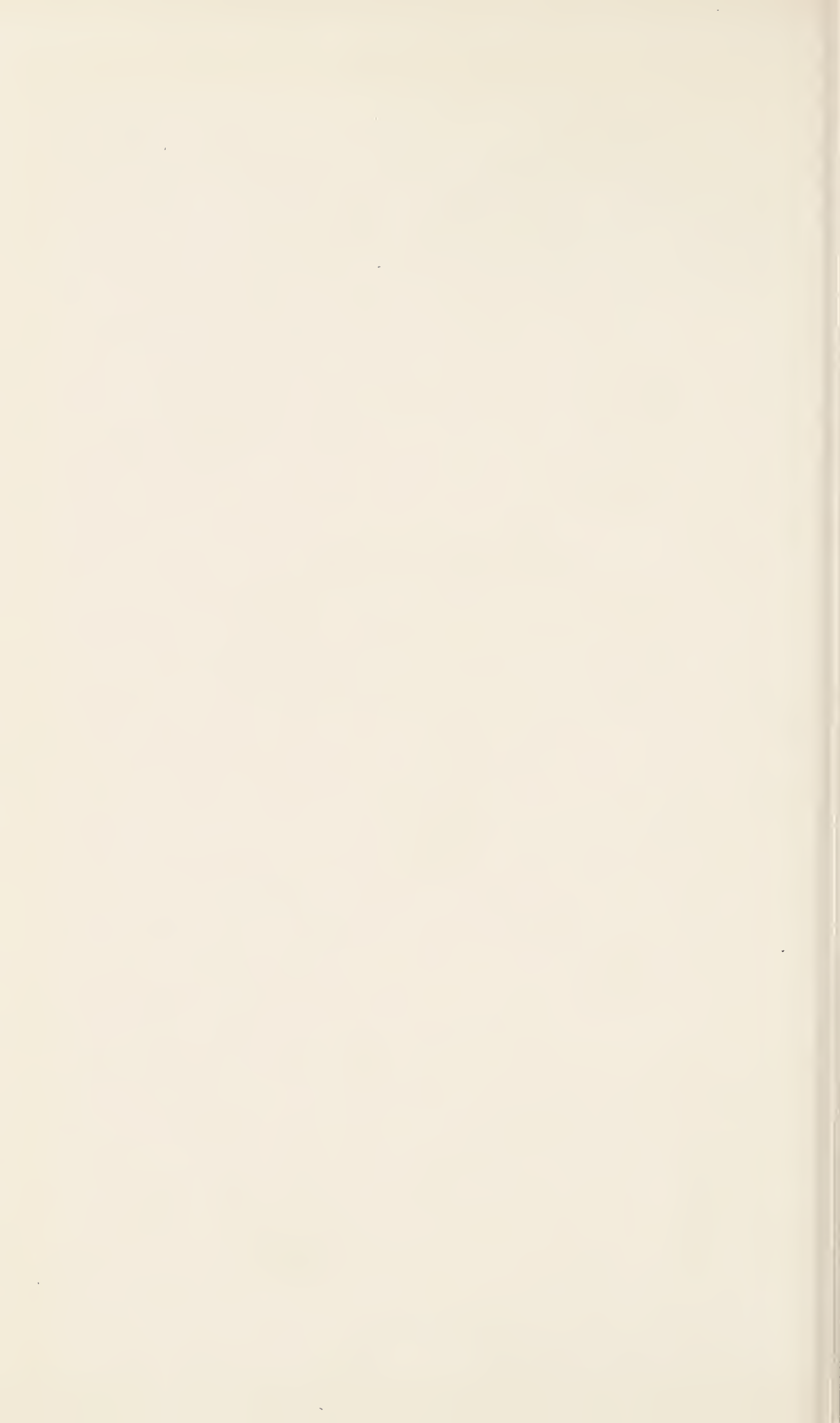
## PLATE VIII

1. TRICHOLOMA TERREUM
2. „ GAMBOSUM
3. „ PERSONATUM
4. SECTION THROUGH CAP OF FIG. 3
5. TRICHOLOMA CARNEUM
6. ARMILLARIA SUBCAVA



PLATE VIII.





in. across ; gills crowded, narrow, whitish ; stem almost equal, solid, apex downy, whitish, stout,  $2-2\frac{1}{2}$  in. long.

Often growing in fairy-rings, or tufted. Smell pleasant, like new meal.

In pastures, etc., appearing in the spring. Edible.

\*\* *Gills discoloured, rufous or smoky.*

*T. amethystinum*.—Cap convex, then expanded and often wavy, smooth, livid and more or less stained blue, edge paler and wrinkled,  $1\frac{1}{2}-2$  in. across ; gills crowded, white, then rufescent ; stem narrowed at the base, paler than the cap,  $1\frac{1}{2}-2$  in. long.

Cap pale, sometimes tinged olive, and spotted with clear blue.

In pine woods.

*T. albellum*.—Cap convex, then expanded and gibbous, white, pallid greyish when dry, often mottled or with scale-like spots, 2-3 in. across ; gills closely crowded, white ; stem ovately bulbous, cylindrical above, white,  $1\frac{1}{2}-2$  in. long.

Sometimes large, at others small and tufted. Cap very pale tan or whitish. *T. gambosum* differs in having the apex of the stem downy.

In woods, etc. Appears early in spring.

*T. boreale*.—Cap irregular, somewhat umbonate, smooth, downy when dry, flesh-colour, then whitish, about 2 in. across ; gills thin, crowded, white ; stem smooth, unequal, whitish, 2-3 in. long.

Gregarious or tufted, smell like new meal.

Among grass in woods.

*T. tigrinum*.—Cap convex, then expanded, often wavy, smooth, pale brown or greyish white, with darker crowded spots,  $1\frac{1}{2}-2$  in. across ; gills crowded, narrow, white ; stem white, pruinose, solid, about 1 in. long.

Differs from *T. guttatum* in the cap not being broken up, and the even edge of the cap.

In fir woods, etc.

*T. pes-capræ*.—Cap conical, then expanded, umbonate, unequal, 1-2 in. across, sometimes more, greyish brown, variegated ; gills broad, white, then greyish ; stem about 3 in. long, smooth, white.

Gregarious or partly tufted. Brittle.

6. *Cap compact, then spongy, obtuse, even, smooth. Gills often spuriously decurrent, but sinuate.*

\* *Gills not discoloured.*

*T. patulum*.—Cap convex, then plane, often wavy, even, smooth, pale ashy grey, not spotted,  $2\frac{1}{2}-4$  in. across ; gills almost free, crowded, whitish ; stem smooth, pure white, 2-4 in. long.

Much resembling some of the larger species of *Clitocybe*, as *C. decastes*. Often luxuriant and in clusters during a rainy season. In mosses, meadows, under birches, etc.

*T. schumacheri*.—Cap convex, then expanded, regular, even,



smooth, uniform livid grey, extreme edges projecting beyond the gills and incurved, about 3 in. across ; gills closely crowded, white ; stem equal, base sometimes somewhat bulbous, slightly striate, white, stout, 3-4 in. long.

In woods.

*T. circumtectum*.—Cap convex, very obtusely umbonate, edge wavy, incurved, downy, disc pale tan, greenish olive tinge towards the edge, at length all pale tan, 2-3 in. across ; gills white ; stem narrowed at the extreme base, striate, whitish, about 1 in. long.

On the ground under trees.

*T. arcuatus*.—Cap convex, then plane, obtuse, even, smooth, blackish umber or rufous brown, paler with age, 2-3 in. across ; gills crowded, narrow, pure white ; stem more or less bulbous, base blackish, more or less squamulose, then naked, stout, about  $1\frac{1}{2}$  in. long. Flesh brownish.

Allied to *T. panæolum*, which differs in the greyish gills. *T. mela-leucum* differs in its white flesh.

Among grass in pastures.

*T. oreinum*.—Cap convex, then plane, smooth, fuscous, then livid, about 1 in. across ; gills free, crowded, white ; stem about 1 in. long, whitish, apex with whitish squamules.

On heaths, etc.

*T. album*.—Entirely white. Cap convex, then expanded, disc sometimes yellowish, dry, 3-4 in. across ; gills crowded ; stem about 3 in. long, narrowed upwards, almost smooth, elastic.

Disc usually tinged yellow. Smell weak but taste acrid.

In woods.

*T. leucocephalum*.—Pure white, without a tinge of yellow. Cap convex, then plane, thin, tough, covered with pure white silky down when young, about  $1\frac{1}{2}$  in. across ; gills almost free, crowded, thin ; stem up to 2 in. long, smooth, hollow, rooting.

Smell strong, like new meal. *T. album* differs in being inodorous. *T. inamœnum* differs in the strong, unpleasant smell, and very broad gills.

On naked ground, or among grass.

\*\* *Gills discoloured*.

*T. militare*.—Cap convex and gibbous, then expanded and wavy, almost smooth, viscid, cinnamon or yellowish, 4-7 in. across ; gills slightly crowded, white, then spotted ; stem somewhat bulbous or thickened at the base, squamulose or coarsely fibrillose, pallid,  $3\frac{1}{2}$ -5 in. long.

Smell and taste unpleasant. Differs from *T. civile* in the strong smell and spotted gills.

In woods, etc.

*T. civile*.—Cap convex, then almost plane, even, smooth, rather viscid, gilvous or pale yellowish brown, about 3 in. across ; gills

deeply emarginate, crowded, white, then yellowish, not spotted ; stem 2–2 $\frac{3}{4}$  in. long, whitish, fibrillose squamulose.

In pine woods.

*T. duracinum*.—Cap 2–3 in. across, broadly gibbous, dry, smooth, edge incurved, shining, grey with olive tinge ; gills crowded, grey ; stem about 2 in. long, greyish white, reticulately scaly above.

Flesh of centre of cap nearly 1 in. thick.

On the ground under cedars.

*T. personatum* (Blewits) (Pl. VIII, fig. 3).—Cap about 3 in. across, fleshy, convex, then expanded, regular, smooth, moist, pale dingy yellowish tan, sometimes tinged grey or lilac ; gills crowded, violet, then dingy ; stem about 2 in. long, rather bulbous, coloured like the cap, often with a violet tinge.

Gregarious, often forming large fairy-rings. Cap occasionally lilac or violet, shining as if oiled, edge incurved, downy ; edible ; brownish when old.

In pastures and woods.

*T. nudum*.—Whole fungus violet at first. Cap 2–4 in. across, depressed, often wavy, flesh thin, edge incurved, naked ; gills bright violet when young, then brownish violet ; stem 2–3 in. long, elastic, fibrillose, with a white bloom.

Differs from *T. personatum* in thin flesh and naked edge of cap, and from *T. sordidum* in persistently incurved edge of cap. Edible.

Among heaps of leaves, under trees, etc.

*T. cinerascens*.—Cap 2–3 in. across, obtuse, smooth, even, white, then greyish ; gills white, then reddish grey, finally dingy yellow ; stem often curved, fibrous, coloured like the cap.

In woods. Tufted. Cap sometimes pale ochraceous.

*T. sævum*.—Cap convex, then plane, the edge remaining incurved for a long time, buff, 2–3 in. across, flesh thick ; gills crowded, narrow, pallid ; stem short, about 1 in. long, stout, streaked with bluish purple or lilac, slightly squamulose from the breaking-up of the cortex.

Differs from *T. personatum* in the short, stout, squamulose stem, and the absence of a purple tinge on the gills. *T. glaucocanum* differs in the greyish purple gills.

*T. glaucocanum*.—Cap fleshy, soft, convex, then expanding, moist, bluish grey, edge involute or incurved, somewhat floccosely pruinose or downy, 2–3 in. across ; gills emarginate, very much crowded, greyish purple, readily separating from the cap, as in *Paxillus* ; stem solid, more or less bulbous, fibrillose striate, slightly squamulose upwards, whitish grey.

Smell strong of new meal, taste mild. Becoming hoary when dry. Said to be edible. May possibly have been passed over as some form of *T. terreum*. Is said to hover between *T. personatum* and *T. sævum*.

On the ground under conifers.



*T. panæolum*.—Cap convex, then flattened, usually wavy and often excentric, sooty-grey, and covered with grey bloom, about 3 in. across; gills crowded, white, then grey or tinged rufous; stem elastic, smooth, greyish white, 1–1½ in. long.

On the ground.

*T. cnista*.—Cap convex, then plane, even, smooth, pale tan or whitish, disc darker, 2–3 in. across; gills broad, crowded, veined, white, pallid yellow when bruised; stem 1½–2 in. long, smooth, white, tough.

Among grass in open spaces.

7. *Hygrophanous*. Cap thin, somewhat umbonate, flesh at length soft.

*T. melaleucum* (Pl. VII, fig. 1).—Cap convex, then plane, obsoletely umbonate, smooth, sooty brown, dingy tan when dry, 1½–3 in. broad; gills crowded, white; stem whitish, with smoky fibrils, 2–3 in. long.

Known by the sooty cap, thin flesh, and white gills. *T. oreinum* differs in having whitish squamules at the apex of the stem.

On the ground in cultivated places, woods, etc.

var. *polioleucus*.—Size of typical form, cap livid grey; apex of stem with white meal.

On the ground.

var. *porphyroleucus*.—Smaller than the typical form. Cap fleshy, umbo darker and evanescent. Stem fibrillose.

On the ground in woods.

*T. grammopodium*.—Cap campanulate, then convex, even, smooth, obtusely umbonate, brownish or livid when moist, whitish when dry, 3–6 in. across, sometimes whitish; gills narrowed at both ends, closely crowded, white; stem 3–4 in. long, base thickened, whitish, longitudinally grooved.

Often forming large fairy rings.

Among grass in pastures, etc.

*T. brevipes*.—Cap convex, then flattened, the umbo soon disappearing, blackish umber or brown, 1½–2½ in. broad; gills crowded, ventricose, at first with a brown tinge, then whitish; stem short, firm, rigid, stout, about 1 in. long, brown both outside and inside, solid, more or less swollen at the base.

On the ground in gardens, under hedges, etc.

*T. humile*.—Convex, then expanded, wavy, sometimes umbonate, at others depressed, even, smooth, blackish brown, livid or pallid, depending on the amount of moisture in the cap, 2–3 in. across; gills crowded, whitish; stem greyish white, entirely covered with a very delicate down, soft, fragile, 1–2 in. long.

Variable, often tufted. Differs from *T. brevipes* in being tufted, and in the thinner stem.

In gardens, among cinders, grass, etc.



var. *blandus*.—Size of typical form, cap thin, greyish lilac ; gills broad, nearly free, pure white ; stem slender, rather bulbous. Among grass, etc.

*T. exsiccum*.—Cap campanulate, then expanded and then umbonate, greyish brown, hoary when dry, 1–1½ in. across ; gills crowded, clear white ; stem about 1 in. long, whitish, polished, and shining. Known by the polished white stem, and cap not becoming pale, but shining when dry.

*T. subpulverulentum*.—Cap convex, then plane, livid and pruinose, whitish and hoary when dry, about 1½ in. across ; gills crowded, narrow, white ; stem 1–2 in. long, smooth, slightly striate, whitish.

Among grass in pastures.

\*\* *Gills violet, grey, or smoky.*

*T. sordidum*.—Cap 1–3 in. across, expanded and more or less umbonate, often wavy, livid lilac, or flesh-colour, then pale ; gills violet, then pallid or smoky ; stem about 2 in. long, slightly curved, fibrillose, coloured like the cap.

Allied to *T. nudum*, but smaller and more slender ; tough.

On the ground, among manured ground, etc.

*T. pædidum*.—Closely allied to *T. sordidum*, but distinguished by the absence of any trace of a violet tinge.

*T. lixivium*.—Cap 2–3 in. across, thin, expanded, and umbonate, smooth, greyish brown, then umber ; gills grey ; stem about 2 in. long, fibrous, often wavy, fragile, grey, at first covered with white down.

Readily distinguished by the umbonate cap and broad grey gills. In woods.

*T. putidum*.—Cap about 1 in. across, umbonate, somewhat olive-grey, hoary ; gills grey ; stem about 1½ in. long, grey, with a white bloom.

Smell strong, rancid.

Among pine leaves, etc.

#### RUSSULA

Cap regular, rigid, fleshy ; gills rigid, fragile, edge thin and sharp ; stem central, stout, rigid ; ring absent.

Most closely allied to *Lactarius*, differing in the absence of milk.

1. *Taste mild*. (In some species the taste is mild at first and gradually becomes more or less acrid.)

\* *Gills ochraceous.*

*R. alutacea*.—Cap 2–4 in. across, blood-red or blackish purple disc, or altogether becoming pale ; gills broad, deep ochraceous, not powdery ; stem about 2 in. long, stout, white, often tinged red.

Distinguished by the broad deep ochraceous gills that do not become powdered with the spores.

On woods, especially beech.

*R. integra*.—Agreeing in many points with *R. alutacea* ; differing in the paler yellow gills becoming powdery with the spores.

In woods.

*R. nauseosa*.—Cap about  $1\frac{1}{2}$  in. across, soon depressed, dingy purple or lilac, disc darker ; gills dingy ochre ; stem  $1-1\frac{1}{2}$  in. long, white. Smell strong and very unpleasant. Agrees with *R. nitida* in the smell, but differs in the rather distant dingy ochraceous gills.

In woods.

*R. vitellina* (Pl. X, fig. 1).—Strong scented. Cap up to  $1\frac{1}{2}$  in. across, yellow ; gills saffron-colour ; stem about 1 in. long, white.

Differs from *R. lutea* in strong smell and striate and tuberculose edge of cap.

In woods.

*R. ochracea*.—Cap about 3 in. across, edge coarsely striate, ochraceous ; gills ochraceous ; stem about  $1\frac{1}{2}$  in. long, ochraceous.

The mild taste and ochraceous colour of every part, including the flesh, stamps this species.

In pine and mixed woods.

*R. lutea* (Pl. IX, fig. 5).—Cap 1–2 in. across, primrose-yellow, then pale ; gills ochraceous yellow ; stem about  $1\frac{1}{2}$  in. long, white.

Differs from *R. vitellina* in the absence of smell.

*R. elegans*.—Cap 2–3 in. across, viscid, rosy flesh-colour, edge soon ochraceous, everywhere granulated ; gills ochraceous orange ; stem up to 2 in. long, white, base ochraceous.

In damp woods.

*R. armeniaca*.—Very fragile. Cap  $1-1\frac{1}{2}$  in. across, peach-colour, edge paler ; gills bright ochre or almost egg-yellow ; stem white.

Among grass under trees.

\*\* *Gills yellow, without an ochraceous tinge.*

*R. cœrulea*.—Cap 2–3 in. across, bluish or bluish purple ; gills pale yellow ; stem about 2 in. long, white.

*R. nitida*.—Smell unpleasant. Cap about 2 in. across, purplish bay, but variable, shining ; gills sulphur-colour, not powdered ; stem 2–3 in. long, white, then pallid.

*R. aurata*.—Cap 2–3 in. across, citron-yellow, orange, red, etc., disc darker ; gills yellowish white, edge bright citron-yellow ; stem 2–3 in. long, white or citron-yellow.

In woods, under pines, etc.

*R. decolorans*.—Cap 3–4 in. across, orange-red, then yellow and bleaching ; gills white, then yellowish ; stem up to 4 in. long, stout, white.

Flesh of cap and more especially of stem becoming grey with age ; in this point it agrees with *R. depallens*, differing in the long stem and in the gills becoming yellow.

In pine and mixed woods.



*R. grisea*.—Mild. Cap fleshy, firm, globose, then expanded, and often depressed, polished, olive or greyish, disc purplish, then yellowish, becoming pale, edge vaguely striate when old, 3–4 in. across; flesh violet below the thin cuticle; gills adnate, crowded, rather thick and somewhat forked, white, then yellow; stem solid but spongy, elongated, cylindrical, even, polished, white, 4–5 in. long.

About the colour and size of *R. integra*.

In broad-leaved woods.

*R. punctata*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, rosy, disc darkest, with dark point-like warts, then pale; gills yellowish, edge often reddish; stem about 1 in. long, colour of cap.

Among grass.

*R. olivacea*.—Cap 3–4 in. across, dingy purple with an olive tinge or brownish olive; gills yellow; stem 2–3 in. long, pale rose colour.

The cap is minutely squamulose, and this separates the present species from *R. rubra*.

In pine woods.

*R. linnæi*.—Cap 3–4 in. across, blood-red or dark rose, all one colour; gills white, yellow when dry; stem up to 3 in. long, blood-red.

In woods.

*R. chamæleontina*.—Cap 1–2 in. across, deep rose-red or purplish lilac, becoming yellowish; gills narrow, yellow; stem 1–3 in. long, white.

In woods, especially pine.

*R. puellaris*.—Cap 1– $1\frac{1}{2}$  in. across, thin, purplish livid, then yellowish, disc permanently darker, tuberculosely striate; gills white, then pale yellow; stem 1– $1\frac{1}{2}$  in. long, white or yellowish.

In woods.

\*\*\* *Gills white or creamy white* (never yellow nor ochraceous, but in some species becoming blackish with age).

† *Cap white or cream colour*.

*R. virginea*.—Every part persistently pure white. Cap about 2 in. across; stem about 2 in. long.

In woods.

*R. semicrema*.—Cap about 3 in. across, fleshy, polished, white, edge incurved; gills white; stem 1–3 in. long, stout, white, its flesh becoming blackish when broken.

Differs from *R. adusta* and *R. densifolia* in the persistently white cap, its flesh also; from *R. delicata* in the flesh of the stem becoming blackish.

Among leaves in woods, etc.

*R. lactea*.—Cap about 2 in. across, often excentric, white, then creamy; gills free; stem up to 2 in. long, stout.

Known by the entirely white or cream colour, and very broad, thick gills.

In woods.

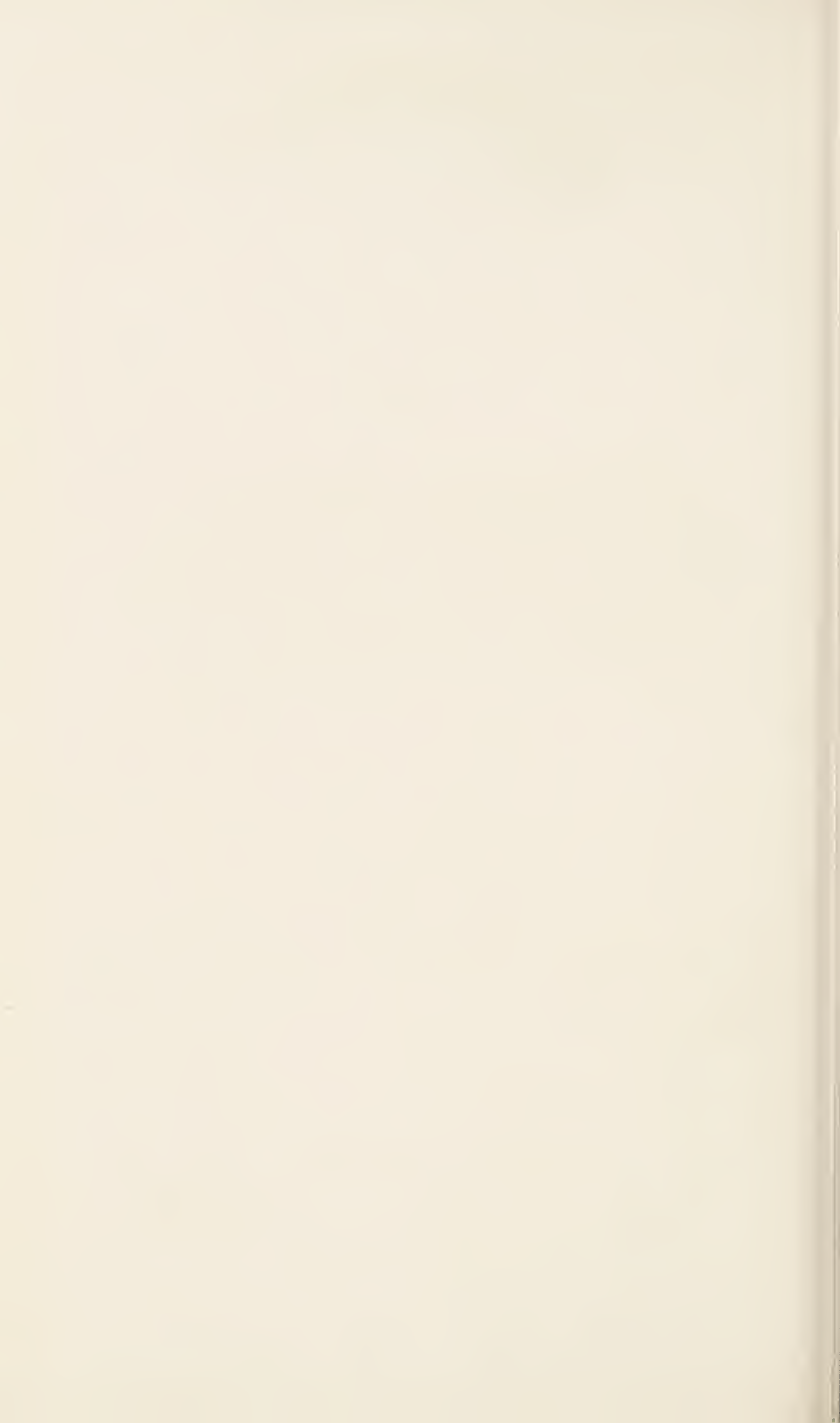


## PLATE IX

1. RUSSULA CYANOXANTHA
2. SECTION THROUGH CAP OF FIG. 1
3. RUSSULA RUBRA
4. SECTION THROUGH CAP OF FIG. 3.
5. RUSSULA LUTEA
6.     ,,     AZUREA



PLATE IX.





*R. nigricans*.—Cap 3–6 in. across, fleshy, whitish, then sooty olive, finally black ; flesh firm, white, reddish when broken ; gills thick, broad, distant, brittle, pallid, reddish when bruised ; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, stout, white, then blackish, solid.

Becomes entirely black with age. Differs from *R. adusta* by the flesh becoming reddish when cut and by the much thicker and more distant gills. *R. densifolia* also becomes reddish when cut, but differs in the thin, somewhat crowded gills.

*R. adusta*.—Cap 3–4 in. across, white, then brownish, or with a scorched appearance ; gills thin, crowded, pallid ; stem up to 2 in. long, pallid, then sooty.

In woods.

*R. chloroides*.—Cap 4–6 in. across, soon depressed, shining, white ; gills slightly decurrent, white with a slight tinge of green ; stem up to  $1\frac{1}{2}$  in. long, stout, white, often with a tinge of green close to the gills.

Distinguished by the green shade of the gills. Differs from the white species of *Lactarius* in the absence of milk.

*R. densifolia*.—Cap 3–4 in. across, whitish, then brown or greyish ; flesh white, red when broken ; gills white or with a pink tinge ; stem up to 2 in. long, stout, pale.

Differs from *R. adusta* in the flesh becoming red when broken.

In woods, etc.

†† Cap clear yellow.

*R. citrina*.—Cap 2–3 in. across, bright lemon-yellow, occasionally with a tinge of green ; gills white ; stem 2–3 in. long, white.

In woods.

*R. fingibilis*.—Cap about 2 in. across, viscid, clear yellow ; gills white ; stem up to  $1\frac{1}{2}$  in. long, white.

Differs from *R. citrina* in the viscid cap.

††† Cap green or olive.

*R. olivascens*.—Cap 2–3 in. across, olive, the disc becoming yellowish, edge even ; gills white, then yellowish ; stem 1–2 in. long, white.

Woods and among bushes, etc.

*R. heterophylla*.—Cap 2–3 in. across, polished, colour varied, greenish with ochraceous disc, yellowish brown, etc. ; gills very narrow, closely crowded, white ; stem about  $1\frac{1}{2}$  in. long, stout, white.

*R. azurea* (Pl. IX, fig. 6).—Cap about 2 in. across, glaucous green, olive-green, or with a tinge of purple, everywhere covered at first with a dense white bloom ; gills pale cream-colour ; stem about  $1\frac{1}{2}$  in. long, white.

Among grass under trees.

*R. virescens*.—Cap 3–5 in. across, dingy opaque green ; flocculose

and broken up into angular squamules ; gills free, white ; stem about 2 in. long, white.

Readily distinguished by the cuticle of the cap becoming broken up into areolate squamules.

In woods.

*R. furcata*.—Cap 3-4 in. across, smooth, but often frosted with a slight silkiness, livid green or greenish umber, pellicle separable ; gills broad, narrowed at each end, forked, white ; stem 2-3 in. long, white.

In woods and among grass under trees.

*R. æruginea*.—Cap 3-4 in. across, verdigris-green, edge striate ; gills broadest in front, white ; stem about 2 in. long, white.

In woods.

†††† Cap red, brownish or purple (sometimes with more or less green intermixed).

*R. lepida*.—Cap 3-4 in. across, blood-red with a rosy tinge, becoming pale or whitish, especially the disc, cracked into squamules ; gills white ; stem about 2 in. long, white.

Cap almost equally fleshy, blood-red with a rosy tinge, disc becoming whitish. *R. virescens* and *R. cutefracta* agree with the present in having the cuticle broken up or cracked into squamules ; the former differs in the green colour ; the latter in never becoming pale at the disc.

In woods.

*R. xerampelina*.—Cap 3-4 in. across, dry, usually rosy purple, disc becoming pale yellow, sometimes a tinge of olive is present, the cuticle cracked into minute granules when old ; gills white, then yellowish tan ; stem 2-3 in. long, white or partly tinged red.

Differs from *R. ochroleuca* and *R. granulosa* in mild taste and darker ochraceous gills.

In woods.

*R. cutefracta*.—Cap 3-5 in. across, purple, dull red, etc., flesh tinged red under the cuticle, which cracks into areolæ, especially near the edge ; gills white ; stem about 3 in. long, white, tinged purple.

In woods.

*R. vesca*.—Cap about 3 in. across, viscid, with fine, radiating, slightly raised wrinkles, flesh-red, disc darker ; gills crowded, whitish ; stem up to 2 in. long, white, tinged rust-colour when cut.

Distinguished by the finely wrinkled cap ; the flesh, more especially of the stem, turning rusty when cut, and by the decided smell, resembling crab or lobster, when the flesh is bruised.

In woods.

*R. duportii* (Pl. X, fig. 6).—Cap convexo-plane, then depressed, smooth, dry, edge even, the centre rufous or flesh-red, edge bluish,

$1\frac{1}{2}$ – $2\frac{1}{2}$  in. across ; gills broad, distant, white ; stem 1 in. or more long, minutely striate, smooth, white.

The flesh turns reddish brown when cut, and the smell resembles that of crab. Probably only a variety of *R. vesca*.

On the ground in woods.

*R. depallens*.—Cap 3–4 in. across, reddish or brownish at first, then whitish or yellowish, especially the disc ; gills broad, whitish ; stem about  $1\frac{1}{2}$  in. long, pure white, becoming grey.

Cap sometimes deep red. Known by the stem being grey when fully grown.

In woods.

*R. cyanoxantha* (Pl. IX, fig. 1).—Cap 2–4 in. across, soon depressed, lilac or purplish, sometimes olive-green, disc usually pale and yellowish, edge generally bluish or purplish ; gills broad, shining white ; stem 2–3 in. long, white.

In woods, etc.

*R. elephantina*.—Cap 3–4 in. across, convex and umbilicate, brownish tan ; gills whitish, soon spotted yellow ; stem 2–3 in. long, stout, white.

In woods.

*R. mustelina*.—Cap 2–3 in. across, brownish or dingy yellowish ; gills white ; stem about 2 in. long, white.

The only species in the present section with a yellow or brownish cap. Does not turn black.

In woods.

2. *Taste acrid or hot.*

\* *Gills yellow or ochraceous.*

† *Cap yellow or ochraceous.*

*R. fellea*.—Cap 1–3 in. across, every part straw-colour.

Readily known by the straw-colour of every part, and intensely acrid taste.

In woods, especially beech.

*R. claroflava*.—Cap 2–3 in. across, deep chrome-yellow, edge paler ; gills yellow, then tinged ochre ; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, white, then grey.

Among grass.

†† *Cap red or purple.*

*R. rubra* (Pl. IX, fig. 3).—Cap 3–4 in. across, soon depressed, polished, deep blood-red, disc becoming tan-colour ; edge often wavy ; gills white, then yellowish ; stem 2–3 in. long, white, sometimes variegated with red. Hard and rigid.

In woods.

*R. drimeia*.—Cap 2–4 in. across, bright purple to dark rose ; gills clear yellow ; stem 2–4 in. long, purplish. Very acrid and peppery.

In woods.



*R. veteriosa*.—Cap about 2 in. across, rosy or flesh-colour, disc becoming pale; gills crowded, white, then straw-colour; stem 2–3 in. long, white.

Distinguished amongst species with pale yellow gills by the clear rosy or pinkish flesh-colour, even cap, and even, white stem which soon becomes hollow.

In woods.

*R. maculata*.—Cap 2–3 in. across, viscid, reddish flesh-colour, then pallid, especially the disc, irregularly blotched with purple or brown; gills adnate, pale sulphur, then peach-colour; stem 1–1½ in. long, white or tinged rose-colour.

In woods.

*R. serotina*.—Cap up to 1 in. across, purplish brown or olive, edge lilac, covered with a white bloom at first; gills white with a yellow tinge; stem about 1 in. long, white.

Distinguished by its small size, cap rarely exceeding 1 in. across. On the ground under beeches, etc.

\*\* *Gills white*.

† *Cap ochraceous or umber*.

*R. ochroleuca*.—Cap 3–4 in. across, polished, dingy ochraceous, becoming paler; gills white, then pallid; stem 2–3 in. long, soft and spongy, white, then grey.

Distinguished by the dingy yellow cap, broad, white gills rounded behind, and the soft, grey stem.

In fir woods, etc.

*R. granulosa*.—Closely resembling *R. ochroleuca*, differing in the disc of the cap becoming broken up into granules, and the white, mealy, or granular stem, which does not change to grey.

On the ground under trees.

*R. fæstens*.—Smell strong and unpleasant. Cap 3–6 in. across, rigid and fragile, subglobose, then expanded or depressed, dingy ochraceous, becoming pale, edge incurved at first, grooved and tuberculose; gills whitish; stem about 2 in. long, whitish.

Known by the strong smell and grooved, tuberculated edge.

In woods.

*R. consobrina*.—Cap about 3 in. across, dark grey or olive-brown, edge even, thin; gills clear white; stem 2–3 in. long, clear white, then grey.

Very acrid. Known by the even, umber or olive-brown cap with a grey tinge.

In woods.

var. *sororia*.—Resembling the type, but edge of cap striate.

*R. pectinata*.—Cap about 3 in. across, flesh yellowish just under the cuticle of the cap, depressed, viscid, brownish tan, then paler, disc darker, edge thin, grooved, and tuberculose; gills narrow, crowded; stem about 2 in. long, white.

Smell unpleasant. Differs from *R. consobrina* in sulcate edge of cap. In woods.

*R. sardonias*.—Cap 2–3 in. across, viscid in damp weather, colour variable, pallid, with yellowish spots, dingy yellow or reddish, edge even; gills adnate, spotted with yellow when dry; stem  $1\frac{1}{2}$ –2 in. long, white or reddish.

In woods among grass, etc.

†† Cap red or purplish.

*R. emetica*.—Cap 3–4 in. across, flesh reddish just under the cuticle, polished, deep rose or blood-red, bleaching almost to white, edge grooved and tuberculose; gills clear white; stem 2–3 in. high, white or tinged red.

Very acrid. Easily known by the pure white gills and deep rose or crimson-lake coloured cap, which bleaches to white. Often eaten by slugs. Poisonous.

var. *clusii*.—Differs from the type in the gills becoming pale yellow.

*R. rosacea*.—Cap 2–4 in. across, rosy flesh-colour, often with darker spots, bleaching here and there; gills adnate, white; stem  $1$ – $1\frac{1}{2}$  in. long, white, tinged rose.

Distinguished from allies by the thick flesh of the cap and white adnate gills.

In woods.

*R. sanguinea*.—Cap 2–4 in. across, depressed, polished, blood-red, edge becoming pale; gills truly decurrent, white, very narrow; stem  $1$ –2 in. long, white, then reddish.

Known from all other species by the decurrent, narrow gills.

Among grass in woods.

*R. fragilis* (Pl. X, fig. 7).—Cap  $1$ – $1\frac{1}{2}$  in. across, colour variable, usually flesh-colour, bleaching almost white, with reddish spots remaining, edge striate and tuberculate; gills pure white; stem  $1$ – $1\frac{1}{2}$  in. long, shining white.

Difficult to distinguish from slender forms of *R. emetica*, but is altogether more slender and fragile; gills more crowded and thinner, and flesh of cap not red under the cuticle.

In woods, etc.

var. *nivea*.—Every part pure white.

var. *violacea*.—Cap bright violet, with a whitish edge, sometimes spotted with yellow, green, or olive.

var. *fallax*.—Cap dingy pale reddish or with a purple tinge, disc very dark-coloured.

*R. queletii* (Pl. X, fig. 3).—Cap 2–3 in. across, dark violet or dusky, edge striate, purplish lilac; gills white; stem  $1\frac{1}{2}$ –2 in. long, purplish violet, often paler than the cap.

Distinguished by the purple cap and stem.

## PLATE X

1. *RUSSULA VITELLINA*
2. SECTION THROUGH CAP OF FIG. 1
3. *RUSSULA QUELETHI*
4.     ,,     *ALUTACEA*
5. SECTION THROUGH CAP OF FIG. 4
6. *RUSSULA DUPORTII*
7.     ,,     *FRAGILIS*





PLATE X.





*R. luteotacta*.—Cap convex, then plane and subumbonate, wrinkled, carmine-scarlet, becoming whitish at the striate edge, up to 2 in. across; flesh white, red under the cuticle, stained yellowish when bruised; gills adnate, forked, pale straw-colour, yellow when bruised; stem equal or slightly tapering downwards, wrinkled, white tinged with lilac, yellowish when bruised, up to 2 in. long.

Characterized by the flesh becoming tinged yellow when cut or bruised. Taste acrid.

On the ground under trees.

### MYCENA

Pileus regular, thin, usually striate or fluted, campanulate or bell-shaped, almost cylindrical when young, and with the margin of the pileus straight and pressed flat to the stem; stem central, hollow; gills adnate or adnexed, often with a decurrent tooth slightly running down the stem, white, or tinged grey or pink.

Most of the species are small and delicate, often brightly coloured, and sometimes strong-scented. The margin of the gills often differs in colour from the rest of the gill. Growing on wood, twigs, dead leaves, etc.; some grow in the ground.

*Collybia* differs in the edge of the pileus being incurved in the young stage.

For facility of determination the species are grouped under the following sections:—

#### *Lactipedes*

Stem rooting, giving out a white or coloured juice or milk when broken.

#### *Calodontes*

Gills having the edge distinctly darker and differently coloured to the remainder.

#### *Glutinipedes*

Stem distinctly viscid or glutinous.

#### *Basipedes*

Stem attached by a small flattened disc or bulb at the base.

#### *Siccipedes*

This somewhat extensive section of the genus *Mycena* is mainly distinguished by negative characters. The members are devoid of any of the features respectively characteristic of the foregoing sections. The stem is always dry, contains no milky juice and no bulb at the base; the margin of the gills is not different in colour from the remainder. The species vary much in size, some being the largest and others amongst the smallest included in the genus. Gills white or often grey; stem firm and rigid or very slender and weak, usually considerably elongated.



## PLATE XI

1. MYCENA HÆMATOPODA
2. „ BERKELEYI
3. SECTION OF CAP OF FIG. 2
4. MYCENA PURA
5. „ POLYGRAMMA
6. „ FILOPES
7. OMPHALIA MAURA
8. MYCENA LEUCOGALA
9. „ RUGOSA
10. OMPHALIA POSTII
11. „ TELMATIÆA
12. „ HYDROGRAMMA



PLATE XI.





## LACTIPEDES

1. *Milk White*

*M. galopoda*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. high, bell-shaped, more or less umbonate, rather strongly striate, blackish, then greyish, sometimes almost white with a dark top; gills white; stem 2–3 in. long, greyish, thickened and downy below, where it liberates a copious supply of white milk when cut or broken.

Among moss on fallen wood, trunks, etc.

Readily distinguished by the copious supply of pure white milk when the base of the stem is broken. Colour variable. The darker coloured varieties somewhat resemble *M. leucogala*, but differ in having white gills.

*M. leucogala* (Pl. XI, fig. 8).—About the size of *M. galopoda*. Cap deeply grooved, purplish brown, umbo blackish; gills grey; stem 2–3 in. long, blackish, giving out a quantity of white milk when broken near the base.

Differs from *M. galopoda* in having grey gills. Also resembling in general appearance *M. pullata* and *M. atrocyanea*, both of which differ in the absence of milk.

On stumps. Often occurring in dense clusters.

2. *Milk Red*

*M. hæmatopoda* (Pl. XI, fig. 1).—Cap bell-shaped, striate, 1–1½ in. high, thin, edge slightly toothed, reddish yellow, top darker red; gills whitish; stem about 2 in. long, reddish, liberating dark blood-red milk or juice when crushed.

Growing in tufts. The notched edge of the cap and the entirely white gills mark this fungus amongst those containing red milk.

On trunks and stumps of alder, etc.

*M. sanguinolenta*.—Cap bell-shaped, very thin, striate, reddish, up to  $\frac{1}{2}$  in. across; gills tinged red, margin dark red; stem up to 2 in. long, very slender, liberating reddish watery juice at the base when broken.

This little fungus shows the hopelessness of attempting to bound groups by a single character. It agrees with the Lactipedes in containing milk in the stem, but it also agrees with the section Calodontes in having dark-edged gills.

Distinguished by the even edge of the cap and the dark-edged gills.

On dead leaves, twigs, moss, etc.

*M. cruenta*.—Somewhat similar in size and general appearance to *M. sanguinolenta*; gills entirely white; stem 2–3 in. long, slender, containing dark red juice, more especially at the base.

Distinguished from *M. sanguinolenta* by the absence of a dark edge to the gills, and from *M. hæmatopa* by its smaller size, and by the even edge of the cap.

In pine woods, on fir cones, needles, etc.

3. *Milk Yellow or Saffron*

*M. chelidonia*.—Cap bell-shaped, then convex, about  $\frac{1}{2}$  in. across, yellowish red ; gills white, tinged yellow ; stem 1–2 in. long, very slender, yellowish, liberating yellow milk when crushed.

On beech stumps, etc. Often tufted.

*M. crocata*.—Cap campanulate,  $\frac{1}{2}$ –1 in. across, striate, colour variable—reddish, olive, greyish or whitish ; gills whitish ; stem 3–4 in. long, slender, saffron-red, liberating a copious amount of saffron-red juice when broken.

Among heaps of fallen beech leaves, etc.

## CALODONTES

*M. strobilina*.—Whole fungus deep red-colour, not becoming paler. Cap campanulate, up to  $\frac{1}{2}$  in. across, thin ; gills having the edge dark blood-red ; stem slender, up to 2 in. long.

Distinguished from *M. sanguinolenta* by the stem not containing red juice. Often clustered ; base of stem with whitish down, often long and rooting.

On fallen fir cones, fallen leaves, etc.

var. *coccinea*.—Differs from type in edge of gills not being darker in colour than the remainder.

On fir cones and twigs.

*M. rosella*.—Every part clear rose-colour, becoming pale. Smaller and paler in colour than *M. strobilina* ; margin of gills blackish purple.

Among moss and pine needles in pine woods.

*M. rubromarginata*.—Cap campanulate, thin, striate, grey, and often more or less tinged purple, up to 1 in. across ; gills pale, edge purple-brown ; stem pallid, 1–2 in. long, up to 1 line in thickness.

Often somewhat resembling *M. hæmatopoda*, from which it differs in dark-edged gills and juiceless stem.

On rotten pine wood, pine stumps, etc.

*M. balanina*.—Cap convex, then plane, often umbonate, pale brownish yellow,  $\frac{3}{4}$ –1 $\frac{1}{2}$  in. across ; gills pinkish, edge purple ; stem 2–3 in. long, brownish, minutely scaly above.

On fallen beech mast and beech leaves.

*M. pelianthina*.—Cap convex, then expanded, striate, purplish, becoming pale when dry ; gills broad, cut out behind, pale purple, with a dark purple edge. The surface of the gills is also spotted with dark purple, due to the presence of clusters of hairs or cystidia ; stem 3–4 in. high, tinged purple, base downy.

A large and very beautiful species readily recognized by the surface of the gills being spotted with purple, and purple edge.

The only species with which it can be mistaken is *M. Berkeleyi*, in which the gills are all one colour.

Among dead leaves in damp woods.

*M. carneosanguinea*.—Cap convex, subumbonate, smooth, livid grey tinged rufous at the umbo, about 1 in. across; flesh white, changing to blood-red; gills rather broad, dull purplish brown, edge purple and denticulate, broad in front and adnate; stem grey, yellowish, and thickened at the base, hollow,  $1\frac{1}{2}$ –2 in. long, flesh at the apex tinged blood-colour,  $1\frac{1}{2}$ –2 in. long (spores  $4\text{--}5 \times 2\text{--}3 \mu$ ). Probably only a form of *M. pelianthina*.

On the ground.

*M. aurantio-marginata*.—Cap campanulate, brownish olive, pale when old,  $1\text{--}1\frac{1}{2}$  in. across; gills with a very slight greenish tinge, edge orange; stem  $1\text{--}1\frac{1}{2}$  in. long, base swollen and covered with yellow down.

Among leaves in pine woods.

*M. elegans*.—Cap campanulate, striate, brown or reddish yellow,  $\frac{1}{2}\text{--}\frac{3}{4}$  in. across; gills tinged grey, edge saffron-colour; stem about 2 in. long, base whitish.

Closely allied to *M. aurantio-marginata*, differing in the absence of yellow down at base of stem.

On the ground in pine woods.

*M. olivaceo-marginata*.—Cap about  $\frac{1}{2}$  in. high, campanulate, honey-colour like the slender stem; edge of gills brownish olive when moist.

Readily distinguished by the whole plant being dull honey-colour, and edge of gills darker.

On lawns and among short grass, common.

#### GLUTINIPEDES

*M. rorida*.—Cap convex, deeply grooved, slightly umbilicate, pale ochraceous, about  $\frac{1}{4}$  in. across; gills slightly decurrent; stem  $1\text{--}1\frac{1}{2}$  in. long, slender, very glutinous.

Distinguished by decurrent gills and glutinous stem.

On dead bramble stems, etc.

*M. citrinella*.—Cap campanulate, then expanded, lemon-yellow; stem lemon-yellow, viscid in moist weather.

Pine woods among moss, etc.

*M. vulgaris*.—Cap about  $\frac{1}{4}$  in. across, convex, then depressed, with a central papilla, viscid, pale brown; gills white; stem about 1 in. long, pale, viscid.

Distinguished by the viscid pileus and stem, cap depressed and with a central papilla.

On pine needles, fallen twigs, etc.



*M. pelliculosa*.—Rather larger than *M. vulgaris*, cap not depressed, brownish, viscid skin separable, stem viscid.

On moorlands, etc., among heather.

*M. epipterygia*.—Cap campanulate, thin, yellowish green, with a very viscid, separable skin in wet weather; stem 2–3 in. long, yellowish, viscid.

Solitary or tufted, resembling *M. alcalina* somewhat in colour, but viscid and devoid of smell.

On fallen branches and twigs among moss in damp places.

#### BASIPEDES

*M. pterigena*.—Minute, only about 1 line across, pale rose-colour; stem 2–4 lines long, very thin, disc radiately striate.

On dead fern fronds, leaves, etc.

*M. discopoda*.—Minute, 1–2 lines across, white, mealy, conical; stem slender, with a minute downy discoid bulb.

Distinguished by the conical, mealy cap.

On dead twigs, etc.

*M. saccharifera*.—Cap whitish, about 2 lines across; gills arcuately decurrent, sprinkled with glistening particles; stem slender, about 2 lines high, with a minute, indistinct disc, often fixed by a few white fibrils.

On brambles and nettle stems, etc.

*M. tenerrima*.—White, cap convex, powdered with white granules, 1–1½ lines across; gills free; stem slender, minutely hairy, fixed by a minute downy disc.

Distinguished by the delicately hairy stem.

On fallen twigs, fir cones, etc.

*M. stylobates*.—White, cap 2–3 lines across, minutely hairy; gills free; stem smooth, disc orbicular, plane, downy, radiately striate.

Distinguished by the flat, white, radiately striate disc.

On twigs, leaves, fern stipes, etc.

#### SICCIPEDES

\* *Cap white or tinged with yellow.*

*M. plicato-crenata*.—Cap conical, rather umbonate, coarsely sulcate, yellowish white, about ½ inch across; gills distant, white; stem 1½–2 in. long, slender, tinged red or brown, viscid.

Known by the sulcate cap and the sticky stem.

Among moss or heath, in larch woods, etc.

*M. clavicularis*.—Cap convex, then expanded, umbonate, striate, disc becoming depressed, yellowish or brownish, ½–⅔ in. across; gills narrow, white; stem about 2 in. long, slender, smooth, viscid, whitish.

Differs from *M. epipterygia* in the dry cap.

*M. vulgaris* and *M. rorida* differ in the viscid cap.  
On the ground.

*M. tenella*.—Tufted. Cap campanulately convex, pellucid, edge striate, white or tinged pink, up to  $\frac{1}{2}$  in. across; gills crowded, white, then tinged pink; stem about 1 in. long, very slender, white.  
On old trunks.

*M. speira*.—Cap conico-convex, then plane, at last depressed, often with a papillate umbo, disc brown, remainder greyish white, variegated with brown lines, 2–6 lines across; gills white; stem shining white, base brownish,  $1\frac{1}{2}$ –2 in. long.

Densely gregarious, but not tufted.

On mossy trunks.

*M. capillaris*.—Cap campanulate, white, about 1 line high; stem thread-like, 1–2 in. long, smooth.

On dead leaves, especially beech.

*M. setosa*.—White, cap about  $\frac{1}{2}$  line across; stem hair-like, about 1 inch long, covered with spreading hairs.

On dead leaves in damp places.

*M. sudora*.—Cap  $1-1\frac{1}{2}$  in. across, thin, convex, umbonate, white, viscid; stem 3–5 in. long.

Distinguished by the viscid cap, elongated stem, and entirely white colour.

On beech trunks.

*M. lactea*.—Cap about  $\frac{1}{2}$  in. across, very thin, striate, white; stem 2–3 in. long, white; habit scattered.

On the ground and on pine needles in pine woods.

*M. gypsea*.—Cap, conico-campanulate, striate, white,  $\frac{1}{2}$ –1 in. across; gills becoming narrow from edge of cap to stem; stem 2–3 in. long, straight, white, brittle. Tufted.

On the ground on chips, etc., on wood.

*M. luteo-alba*.—Cap  $\frac{1}{2}$ –1 in. across, umbonate, very pale yellow; gills white; stem tinged yellow.

In pine woods on the ground.

*M. flavo-alba*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, umbonate, white, tinged yellow or ochraceous, gills white; stem white, pellucid.

Distinguished from *M. luteo-alba* in the white, pellucid stem.

Often in troops amongst short grass, heather, etc.

\*\* *Cap pink or red.*

*M. adonis*.—Cap about  $\frac{1}{4}$  in. across, conical, then campanulate, smooth, rosy, but colour variable; gills narrow, white, then tinged pink; stem about  $1\frac{1}{2}$  in. long, very slender, white, smooth.

In woods among short grass, etc.

*M. juncicola*.—Cap about 1 line across, blood-red or rosy; stem slender, rosy or brownish.

On dead twigs, rushes, etc.



*M. acicula*.—Cap about 2 lines across ; deep orange-red ; gills yellow ; stem slender, tinged yellow.

Distinguished by the yellow gills.

On fallen twigs, wood, etc.

*M. zephira*.—Cap about 1 in. across, campanulate, striate, livid red or pinkish ; gills white ; stem 2–3 in. long, whitish, squamulose, sometimes with a rosy tinge.

Differs from *M. pura* in absence of smell.

On the ground among twigs, etc.

*M. flavipes*.—Cap about  $\frac{2}{3}$  in. across, campanulate or semi-orbicular, rosy pink, purplish or violet, the disc becoming darker ; gills white, then tinged pink ; stem about 2 in. long, polished, yellow, rooting.

On stumps. Clustered or tufted.

*M. pura* (Pl. XI, fig. 4).—Smell strong, resembling radishes. Cap  $1\frac{1}{2}$ –3 in. across, bell-shaped, then expanded, clear pale rose-colour ; gills broad ; stem naked, whitish.

Distinguished by the strong smell.

Pileus sometimes tinged lilac or yellow.

On the ground.

*P. pseudopura*.—Closely allied to *M. pura* but smaller, and has no smell. Differs from *M. zephira* in smooth stem.

On the ground.

\*\*\* Cap yellowish or greenish yellow.

*M. alcalina*.—Smell strong, nitrous. Cap up to 1 in. across, striate, pallid or yellowish green ; stem yellowish, viscid.

Known by the strong nitrous smell and the greenish yellow cap.

On stumps, trunks, etc. Tufted.

*M. codoniceps*.—Cap campanulate, sulcate, sprinkled with short, erect hairs, wholly umber, about 2 lines high ; gills white ; stem whitish above, umber below, 2–4 lines high.

On tree-fern trunks.

*M. hiemalis*.—Cap campanulate, rather umbonate, striate, flesh-colour, rufescent or whitish, often pruinose, up to  $\frac{1}{4}$  in. across ; gills narrow, stem  $\frac{1}{2}$ –1 in. long, slender, curved.

Differs from *M. corticola* in the umbonate cap with striate edge, colour paler ; stem longer.

On trunks of trees.

*M. lineata*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, striate, with fine lines to the centre, becoming expanded and almost flat ; gills white ; stem 2 in. long, downy at base.

On the ground among moss.

*M. farrea*.—Cap very thin, campanulate, then expanded, sub-umbonate, grooved, covered with a white bloom, whitish or yellow-



ish, about  $\frac{1}{2}$  in. across ; gills adnate, white ; stem 2-3 in. long, silky, slightly rooting. Easily known by the pruinose cap.

Among moss and heather.

\*\*\*\* *Cap grey, brownish or blue-black.*

*M. corticola*.—Cap 2-4 lines across, deeply striate, colour variable, blackish, bluish, brownish or grey ; stem up to  $\frac{1}{2}$  in. long, incurved ; gills broad.

Known by growing on bark of trees, among moss, lichens, etc.

*M. collariata*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, bell-shaped, then expanded, brownish, disc darkest ; gills attached to a collar round the stem, which is about  $1\frac{1}{2}$  in. long.

Known by the attachment of the gills.

Among grass in woods.

*M. vitilis*.—Cap 3-4 lines across, conical, then expanded, papillate, striate, brownish or greyish white, then pale ; gills greyish white ; stem 3-6 in. long, very slender, shining, rooting.

Known by the long, slender stem and striate cap.

Among leaves in damp places.

*M. debilis*.—Cap about  $\frac{1}{4}$  in. across, campanulate, then convex, striate, brownish ; gills broadly adnate, whitish ; stem 1-2 in. long, very slender, whitish, not rooting.

*M. collariata* differs in the attachment of the gills.

On the ground among moss.

*M. mirabilis*.—Cap about  $\frac{1}{2}$  in. across, campanulate, finely striate, umbonate, pale bluish grey, umbo darker ; gills distant, white, edge darker ; stem  $1\frac{1}{2}$ –2 in. long, greyish.

Differs from *M. iris* in the umbonate cap.

On fir trunks among moss, etc.

*M. iris*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, bright sky-blue, tomentose, then brownish with blue fibrils ; gills tinged grey ; stem bluish below.

On fir stumps.

*M. filipes* (Pl. XI, fig. 6).—Cap about  $\frac{1}{2}$  in. across, campanulate, then almost flat, striate, brownish grey, greyish or whitish ; gills white ; stem 3-4 in. long, very weak and slender, ending in a mass of fibrils.

Distinguished by the long, slender, rooting stem, fibrillose at the base.

In woods among dead leaves.

*M. plumbea*.—Cap thin, convex, then plane, obtuse, grooved, lead-colour, powdered with white meal,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across ; gills adnate, colour of the cap ; stem greyish, powdery, apex pale, base strigose, 3-4 in. long.

Cap very thin, bluish grey ; stem very fragile, equal. Smell none.

In mossy pastures, etc.

*M. cinerea*.—Entirely grey. Smell strong, like radishes. Cap slightly gibbous, then expanding, edge striate, paler and silky when dry, about 1 in. across; gills adnate, rather distant, edge paler; stem smooth, base with white down, 2–3 in. long, slender.

Differs from *M. leptcephala* in the cap being only slightly striate at the edge, and not grooved; and from *M. metata* in having grey gills.

Among short grass.

*M. amicta*.—Cap conico-campanulate, greyish, striate to the middle, dry, smooth, up to 1 in. across; gills free, grey; stem filiform, downy, 3–4 in. long.

On the ground among leaves, etc.

*M. urania*.—Cap campanulate, then convex, dark violet when young, then blue, finally pale,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across; gills uncinato-adnate, white; stem flaccid, even, smooth, base floccose and somewhat rooting.

Among dead leaves, etc.

*M. atro-alba*.—Cap campanulate, blackish, paler or whitish towards the edge, about 1 in. across, gills assuming a greenish tinge, stem 3–4 in. long, base swollen, hairy.

On the ground.

*M. dissiliens*.—Strong-scented. Cap about 1 in. across, campanulate, greyish brown, deeply grooved; gills broadest in front or at the margin of the pileus; stem greyish.

Very fragile. Smell unpleasant. Stem splitting into portions that curve outwards when the base is broken off.

On trunks and fallen branches.

*M. plicosa*.—Fragile. Cap sulcate, greyish brown; gills grey; stem  $1\frac{1}{2}$ –2 in. long, not quite straight, pale.

Differs from *M. metata* in sulcate cap and absence of smell.

Among grass, etc.

*M. paupercula*.—Strong-scented. Cap 1–2 lines broad, obtusely conical, fibrillose, ochraceous white; gills whitish; stem  $\frac{1}{2}$  in. or more long, whitish, rooting.

Distinguished by the strong, sweet scent and the rooting stem. Allied to *M. psammicola*.

Inside decayed trunks, etc.

*M. atrocyanea*.—Cap campanulate, sulcate, brownish, then bluish grey, up to  $\frac{1}{2}$  in. across; gills united to a collar round the stem; stem blackish blue.

Distinguished from allies by structure of whitish gills and absence of milk in stem.

On the ground in pine woods.

*M. pullata*.—Smell nitrous. Cap campanulate, sulcate, dark brown, centre or disc nearly black; gills white; stem colour of cap, about 3 in. long.



Separated from *M. lycogala* and *M. galopoda* by absence of milk in the stem, and from *M. atrocyanea* by the absence of blue tints.

On the ground among dead leaves, etc.

*M. leptcephala*.—Smell strong, alkaline, entirely grey. Cap sulcate, edge often wavy; gills broad; stem about 2 in. long.

Smell like sweet nitre. Solitary. Differs from *M. alcalina* in the stem not being sticky or viscid.

On trunks and on the ground.

*M. ammoniaca*.—Smell strong, nitrous. Cap umbonate, striate, dark brown or greyish,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across; gills whitish; stem dry, whitish, rooting.

Differs from *M. alcalina* in dry stem. *M. metata* differs in soft substance and hygrophaneous pileus, soon becoming pale.

On the ground.

*M. metata*.—Cap campanulate, slightly striate, grey, becoming pale when dry; gills whitish; stem 2–3 in. long, soft and flaccid, greyish white. Smell alkaline, weak, sometimes absent.

Among moss in fir woods.

*M. peltata*.—Cap soon flat, edge striate, blackish brown, grey when dry, about  $\frac{3}{4}$  in. across; gills grey; stem slender, often wavy. Inodorous.

Among grass and moss.

*M. consimilis*.—Gregarious. Cap bell-shaped, umbonate, edge striate, soon upturned, grey, umbo darker, about 1 in. across; gills narrow, grey; stem pale grey. Inodorous.

Separated from allies by absence of smell.

Among grass.

*M. ætites*.—Campanulate, coarsely striate, with a prominent umbo, dusky brown, about  $\frac{3}{4}$  in. across; gills whitish, connected by veins; stem whitish, shining.

Known among dark-coloured forms by the prominent umbo, coarse striation, and gills connected by veins. No smell.

Among damp moss and grass.

*M. stannea*.—Cap campanulate, then flattened, indistinctly striate, grey, tin-colour, with a silky sheen when dry,  $\frac{3}{4}$ – $1\frac{1}{2}$  in. across; gills greyish white; stem  $2\frac{1}{2}$ – $3\frac{1}{2}$  in. long, shining, pallid, often not quite straight.

Among grass.

*M. vitrea*.—Campanulate, very brittle, finely striate up to the small umbo, livid brown; gills adnate, narrow, whitish, not connected by veins; stem 3–4 in. long, finely striate, shining, colour of cap or paler.

Very fragile. Distinguished among allies by the narrow, adnate gills not connected by veins.

On the ground in damp pine woods.



*M. cohærens*.—Cap about 1 in. across, campanulate, even, smooth, cinnamon or tawny-umber, then pale; gills very broad, white, then pallid; stem shining, bay upwards, tufted at the base, 4–5 in. long.

In woods amongst leaves; also on wood.

*M. psammicola*.—Smell strong, but not nitrous. Cap about  $\frac{1}{4}$  in. across, almost hemispherical, brown, striate; gills white; stem up to  $\frac{3}{4}$  in. long, whitish above, brown below.

Among moss, etc.

*M. berkeleyi* (Pl. XI, fig. 2).—Campanulate, then expanded, slightly umbonate, striate, dingy brown, paler when dry,  $1\frac{1}{2}$ –3 in. across; gills very deeply cut out behind, tinged purple; stem 3–5 in. long, tinged purple.

Our largest *Mycena*, known by the gills being so deeply cut out near the stem.

On rotten wood.

*M. excisa*.—Cap convex, wrinkled, slightly umbonate, brownish, about 1 in. across; gills cut out behind, broad in front (near the margin); stem grey. Tough.

On pine and other trunks.

*M. rugosa* (Pl. XI, fig. 9).—Campanulate, then expanded, tough, dry, irregularly wrinkled with raised ribs, but not striate, grey with a tinge of olive, pale when dry, 1–2 in. across; gills greyish white, connected by veins; stem tough, often flattened, base rooting, fibrillose.

On or near stumps, trunks, etc.

*M. galericulata*.—Conical, then campanulate, then expanded and umbonate, dry, striate up to the umbo, livid brownish, greyish, etc.; gills connected by veins, white, then pinkish; stem polished, pallid. Usually tufted.

Differs from *M. rugosa* in the white gills changing to pink, and in its tufted habit of growth.

On fallen trunks and branches.

var. *calopus*.—Differs from the typical form in the orange-brown stem. Tufted.

*M. tenuis*.—Pure white. Cap about  $\frac{1}{2}$  in. across, brittle, campanulate, then convex, striate; gills distant; stem 2–3 in. long, smooth, pellucid.

Differs from *M. gypsea* in the base of the stem not being strigose, or bristling with hair-like hyphæ.

In damp woods.

*M. prolifera*.—Cap about  $\frac{3}{4}$  in. across, campanulate, then expanded, more or less umbonate, edge coarsely striate, yellowish or brownish tan; gills pallid; stem about 3 in. long, shining, rooting.

Densely tufted; stem often proliferous.

On rotten wood and on the ground.

*M. polygramma* (Pl. XI, fig. 5).—Cap thin, elastic, dark grey with a brown tinge, coarsely striate, 1–1½ in. across; gills pale grey; stem 3–4 in. long, tough, shining, distinctly striate throughout its length, pale grey.

Recognized by the distinctly striate stem.

On stumps and trunks.

*M. parabolica*.—Campanulate, edge spreading, disc blackish with a violet tinge, becoming paler towards the edge, striate, 1–1½ in. across; gills connected by veins, white, base greyish; stem blackish violet above, base coarsely fibrous.

Differs from *M. galericulata* in gills not becoming pink.

On rotten trunks, especially pine.

*M. tintinnabulum*.—Cap tough, becoming almost flat, quite even, viscid when moist, bay or yellowish brown, about 1 in. across; gills becoming tinged pink; stem smooth, even, pallid. Remarkable in the genus for the perfectly smooth, even cap.

On fallen trunks.

#### COLLYBIA

Cap symmetrical, edge incurved when young; gills free or adnexed, soft; stem central, with a cartilaginous cortex.

Nearest to *Marasmius*, which differs in the dry, tough substance and in fully expanding when moistened after being dried. *Clitocybe* and *Tricholoma* differ in the fibrous texture of the stem at the surface. In *Mycena* the edge of the cap is straight and not incurved when young.

1. *Gills white or clear in colour, never grey; flesh white.*

\* *Stem stout, grooved or striate.*

† *Gills broad, rather distant.*

*C. radicata* (Pl. XII, fig. 1).—Cap 1¼–4 in. across, elastic, gibbous, glutinous, brownish olive, ochraceous brown or sometimes with a greenish tinge, radiately wrinkled; gills white; stem 4–7 in. long, ending in a long rooting base, striate, greyish.

Distinguished by the glutinous, wrinkled cap and the long polished stem, ending in a tapering rooting base often a foot or more in length.

Among grass, etc.

*C. henriettæ*.—Cap thin, dry, even, expanded, somewhat downy, yellowish umber, 3–4 in. across; gills broad, broadly adnate, slightly rounded behind, distant, white; stem narrowed upwards, pallid yellowish brown both inside and outside, somewhat pruinose, darker downwards, slightly rooting, 6–8 in. long.

Intermediate between *C. radicata* and *C. longipes*.

On and around stumps, etc.

*C. semitalis*.—Cap 1–4 in. across, convex, then plane, sooty or pitch-black, greyish when dry; gills broad, white, then greyish,

## PLATE XII

1. COLLYBIA RADICATA
2.     ,,     TUBEROSA
3.     ,,     BUTYRACEA
4. SECTION THROUGH CAP OF FIG. 3
5. COLLYBIA MACULATA
6.     ,,     DRYOPHILA





PLATE XII.





spotted black when bruised ; stem brownish or greyish white, 2-4 in. long.

Gills becoming altogether blackish with age.

On the ground. Usually appearing after much rain.

*C. longipes*.—Cap 1-2 in. across, umbonate, pale brown, minutely velvety ; gills white ; stem 4-6 in. long, colour of cap, velvety, rooting.

Known by the velvety cap and stem.

On old stumps, etc.

*C. platyphylla*.—Cap 3-4 in. across, fragile, brown, then grey or pale, fibrillose streaked ; gills cut out behind, broad, distant, white ; stem 3-4 in. long, whitish, striate, base abrupt, and ending in a spreading mass of branched, white, cord-like mycelium.

On rotten wood, among leaves, etc.

*C. fusipes* (Pl. XIII, fig. 4).—Cap  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. across, often umbonate, dry, reddish bay, becoming tan-colour ; gills white, then almost colour of cap and spotted ; stem 3-4 in. long, ventricose or swollen at the middle, grooved, colour of the cap.

On or near stumps. Tufted.

*C. lancipes*.—Cap 2-3 in. across, umbonate, radiately wrinkled, pale flesh-colour ; gills very broad behind, tinged flesh-colour ; stem 3-4 in. long, stout, narrowed towards the base, rooting, whitish with a tinge of flesh-colour.

On the ground.

†† *Gills narrow, crowded.*

*C. maculata* (Pl. XII, fig. 5).—Cap 2-5 in. across, convex, then expanded, whitish, becoming more or less spotted and stained with reddish brown ; gills crowded, white, then pallid ; stem 3-4 in. long, stout, rooting, grooved, white, spotted like the cap.

In pine and other woods, etc.

var. *immaculata*.—Cap and stem not discoloured.

*C. proluxa*.—Cap 3-4 in. across, broadly gibbous, tawny, with a brick-red tinge ; gills free, white, not spotted ; stem about 3 in. long, with a brick-red tinge, grooved.

Among leaves, etc. Tufted.

*C. distorta*.—Cap about 3 in. across, umbonate, bay, becoming pale ; gills white, becoming spotted reddish ; stem about 3 in. long, twisted, grooved, pallid.

On rotten pine trunks, heaps of leaves, etc.

*C. butyracea* (Pl. XII, fig. 3).—Cap 2-3 in. across, umbonate, reddish brown, shining and feeling as if oiled, pale when dry ; gills white, not becoming spotted ; stem 2-3 in. high, base thickened, narrowed upwards, rufous.

Very near to *C. distorta*, differing in the gills not becoming spotted.

On the ground in woods. Growing in troops.



*C. bibulosa*.—Cap 1–2 in. across, obtuse, dusky green when moist, grey when dry; gills narrow, dingy; stem  $1\frac{1}{2}$ –2 in. long, pale clear brown.

On stumps in small clusters.

*C. pulla*.—Cap thin, fragile, campanulate, then gradually expanding, even, smooth, hygrophanous, shining, dark chestnut-brown, purplish bay, livid purplish grey or nearly black, pale when dry,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills adnexed, somewhat broad, crowded, transversely striate, whitish; stem hollow, twisted, somewhat striate, soft, naked, sometimes rooting, whitish, 3–4 in. long.

Under birches, among *Polytrichum*, etc.

*C. xylophila*.—Cap 2–3 in. across, fragile, broadly gibbous, disc brownish tan, edge whitish; gills adnate, white; stem 2 in. long, whitish, striate.

On rotten trunks. Generally densely tufted.

\*\* Stem thin, even, velvety, floccose or pruinose.

† Gills broad, rather distant.

*C. velutipes* (Pl. XIII, fig. 1).—Cap  $1\frac{1}{2}$ –3 in. across, viscid, bright yellow, disc darker or altogether tawny; gills pale opaque yellow; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, dark brown, velvety.

Known by dark brown, velvety stem and tufted growth.

On trunks, logs, etc.

*C. laxipes*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, soon plane, whitish or tinged buff; gills whitish; stem 3–4 in. long, slender, with rufous, velvety down, apex pale. Much smaller than *C. fusipes*.

On chips, twigs, etc.

*C. floccipes*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, umbonate, sooty brown, then pale; gills white; stem  $1\frac{1}{2}$ –2 in. long, whitish, rough with minute black points, rooting.

On stumps and on the ground.

*C. mimica*.—Cap about 1 in. across, smooth, soon plane, dingy ochraceous; stem about 2 in. long, fibrillose, base narrowed, wavy, ochraceous; gills ochraceous, very broad, rather distant, thin, white.

Smell and taste strong, like fish.

Among wood shavings.

*C. vertiruga*.—Cap  $\frac{1}{4}$ –1 in. across, thin, tough, radially wrinkled, dull brown or grey; gills white with a tinge of yellow; stem 2– $2\frac{1}{2}$  in. long, tawny, minutely velvety, base strigose.

Differs from *C. stipitaria* in the dingy cap and the adnate gills connected by veins.

On dead twigs, fern roots, etc.

*C. stipitaria*.—Cap 2–5 lines across, thin, convex, then plane, umbilicate, whitish, with brown fibrils; gills soon free, white; stem 1–2 in. long, tough, brown, more or less hairy.

On grass, twigs, etc.

*C. ingrata*.—Cap about  $1\frac{1}{2}$  in. across, thin, tough, globose, then campanulate, umbonate, dingy brownish tan ; gills free, crowded, very narrow, pallid ; stem 2–3 in. long, often twisted, wavy and compressed, brownish.

Allied to *C. confluens*, but differing in habit and in the brownish stems not being matted together at the base.

Damp localities in woods.

†† *Gills very narrow, closely crowded.*

*C. hariolarum*.—Cap 1–2 in. across, thin, tough, whitish ; gills whitish ; stem up to 3 in. long, reddish brown, apex pale, entirely covered with a whitish woolly down.

On rotten wood and among leaves, especially beech.

*C. confluens*.—Cap about 1 in. across, tough, rufescent when moist, then pale ; gills closely crowded, very narrow ; stem 3–5 in. long, rufous, everywhere covered with white down, often densely crowded and compressed.

Known by the crowded habit, crowded rufous stems covered with white down, and the thin, pliant caps.

In woods among leaves.

*C. conigena*.—Cap  $\frac{1}{2}$ –1 in. across, soon plane, somewhat umbonate, yellowish brick-red, then quite pale ; gills pallid ; stem 1–3 in. long, slender, colour of cap, at first covered everywhere with white powder.

In pine woods on fallen cones and among pine needles.

*C. cirrhata*.—Cap up to  $\frac{1}{2}$  in. across, rufescent, then whitish ; gills white ; stem 1–2 in. long, very slender, wavy, with white mealy down, running out into a long fibrillose root.

*C. racemosa*.—Cap 3–4 lines across, thin, convex, papillate, covered with grey down ; gills adnate, crowded, white ; stem 1–2 in. long, bearing slender, minute stems with abortive pilei, base black, sclerotoid.

Perhaps an abnormal condition of some species.

On decayed agarics, and on the ground.

Among damp moss and leaves.

*C. tuberosa* (Pl. XII, fig. 2).—Cap up to  $\frac{1}{2}$  in. across, thin, umbonate, opaque, white ; gills white ; stem  $\frac{1}{2}$ – $1\frac{1}{2}$  in. long, white, springing from a smooth yellowish or reddish sclerotium, 1–3 lines across.

Growing on old dead species of *Russula* and other agarics, and amongst moss.

\*\*\* *Stem thin, equal, naked, smooth* (except the base).

† *Gills broad, lax, usually more or less distant.*

*C. collina*.—Cap 1–2 in. across, umbonate when expanded, brown or tan-colour, pale when dry ; gills broad, white, then pallid ; stem 3–4 in. long, fragile, smooth, pallid, base downy.

In grassy places.

## PLATE XIII

1. COLLYBIA VELUTIPES
2. MARASMIUS FÆTIDUS
3.       ,,       ANDROSACEUS
4. COLLYBIA FUSIPES
5. MARASMIUS OREADES
6.       ,,       PERONATUS





1



2



4



3



5



6

PLATE XIII.





*C. ventricosa*.—Cap  $1-1\frac{1}{2}$  in. across, umbonate when expanded, pale tan or pale dingy ochre ; gills rather crowded, rufescent ; stem 3-4 in. long, ventricose or swollen near the base, colour of the cap, ending in a rooting base.

In woods.

*C. thelephora*.—Cap  $\frac{2}{3}-1\frac{1}{2}$  in. across, campanulate, umbopapillate, acute, smooth, dingy ochre, disc darker ; gills adnate, whitish ; stem 3-4 in. long, base purplish brown, paler upwards.

Known by the campanulate, lax cap, and acute umbo.

In partly dried-up *Sphagnum* bogs.

Gregarious. Inodorous. Habit of a *Mycena*.

*C. leucomyosotis*.—Strong-scented, rather fragrant. Cap about 1 in. across, convex, then expanded, sometimes umbonate, pale mouse-colour, disc darker, whitish when dry ; gills adnate, sinuate, whitish ; stem 4-5 in. long, very brittle, pallid.

Known by the strong scent, and adnate, sinuate gills.

On *Sphagnum* in bogs.

*C. stevensoni*.—Cap about  $\frac{1}{2}$  in. across, hemispherical, viscid, pale yellow ; gills broadly adnate, distant, white ; stem about  $1\frac{1}{2}$  in. long, externally and internally rufous.

Somewhat resembling *C. esculenta*, differing in the cap not becoming plane, and in the broad, adnate, distant gills.

On the ground.

*C. psathyroides*.—Ivory-white, cap about  $\frac{3}{4}$  in. across, campanulate, viscid ; gills broadly adnate, triangular ; stem 3-4 in. long, hollow, rather tough.

With the habit of a *Psathyra*. Known by the white colour and the very broad, broadly adnate gills.

On the ground.

*C. xanthopoda*.—Cap 1-2 in. across, umbonate, tan-colour, becoming pale ; gills crowded, very broad, whitish ; stem 3-4 in. long, even, smooth, tawny-yellow, base with rooting fibres.

Allied to *C. dryophila*, but distinguished by the umbo, very broad gills and strigose rooting base of the stem. *C. succinea* differs in not being umbonate.

In pine woods, etc.

*C. nitellina*.—Cap  $1-1\frac{1}{2}$  in. across, convex, shining, tawny, often with a brick-red tinge, pale when dry ; gills broadly adnate, white, then pallid ; stem 2-3 in. long, smooth, tawny.

Among grass by paths in pine woods, etc.

*C. succinea*.—Cap 1 in. or more across, expanded, rufous or brownish, cracked when dry ; gills very broad, pallid, edge minutely toothed ; stem 1-2 in. long, polished, pale rufescent.

Distinguished from *C. dryophila* by the broader, thicker, less crowded gills, and from *C. xanthopoda* by the absence of an umbo.

Among grass under trees, etc.



*C. nummularia*.—Cap about  $1\frac{1}{2}$  in. across, thin, soon almost plane and umbonate, pallid or whitish, often variegated with reddish or yellow stains; gills free, white; stem  $1\frac{1}{2}$ –2 in. long, pallid.

Distinguished by the whitish cap which becomes plane and depressed round the small umbo.

Among leaves.

*C. esculenta*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, plane, obtuse, ochraceous-tan or brownish; gills very broad, tinged tan; stem 1–2 in. long, shining, yellowish tan, ending in a long, smooth, descending rooting base, sometimes 6 in. long.

In woods, pastures, etc.

*C. tenacella*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, soon expanded and somewhat umbonate, smooth, brown, becoming pale; gills broad, snow-white; stem 2–3 in. long, thin, straight, tawny, ending in a long, fibrillose rooting base.

Very tough. Differs from *C. esculenta* in the root being downy, and in the snow-white gills.

In woods, especially pine.

†† *Gills narrow, crowded.*

*C. eustygia*.—Smells like rancid meal. Cap  $1\frac{1}{2}$ –2 in. across, convex, then plane, sometimes wavy, dingy white, disc tinged, shining when dry; gills dark grey; stem 2–3 in. long, narrowed into a rooting base, white and sprinkled with minute scales, base darker, striate or fibrous.

Known by the dark grey gills and rancid smell. The whole plant turns black when dry.

On the ground.

*C. retigera*.—Cap thin, campanulate, then expanded and sub-umbonate, smooth, dry, covered with a network of raised ribs (best seen when old), edge striate, pallid, centre tawny-brown, about 2 in. across, gills rather broad, ventricose, edge fimbriate, pallid; stem equal, pallid, base minutely downy, somewhat rooting, 3–4 in. long.

On and around stumps.

*C. planipes*.—Tufted. Cap orbicular, convex, then more or less plane, brownish or bay, the crenulated edge paler, somewhat viscid in moist weather,  $\frac{1}{2}$ –1 in. across; gills almost free, rather broad, whitish; stem usually compressed, slightly striate, coloured like the cap, base brown and rooting, 1–2 in. long.

The tufted habit, rooting stem, and general brownish colour distinguish the present species. First found in Britain in Epping Forest by Mr. A. Clarke, during a most enjoyable mycological ramble with Mr. C. Crossland and the writer.

On dead wood, etc.

*C. acervata*.—Cap 2–3 in. across, obtuse, pale flesh-colour, pale when dry ; gills tinged flesh-colour, then whitish, closely crowded, narrow ; stem 2–4 in. long, rufous or sometimes brown, smooth.

Densely tufted, stems numerous, covered with white down at the base, otherwise polished. Differs from *C. confluens* in the polished stem.

*Marasmius erythropus* much resembles this species but differs in the broad distant gills.

At the base of trunks, etc.

*C. dryophila* (Pl. XII, fig. 6).—Cap 1–2 in. across, convex, then expanded and obtuse, reddish bay or pale tan ; gills almost free, pallid ; stem 1–2 in. long, smooth, yellowish or rufescent, base often swollen when growing in a damp place.

Distinguished from allies by the narrow, crowded gills, and obtuse cap.

Among fallen leaves, on rotten wood, etc.

*C. aquosa*.—Every part honey-colour, hygrophanous ; cap about 1 in. across, tough, plane, edge densely striate, gills much crowded ; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, polished.

Damp woods among moss.

*C. extuberans*.—Cap  $\frac{3}{4}$ – $1\frac{1}{2}$  in. across, convex, then expanded, with a prominent umbo, bay or umber ; gills nearly free, crowded, narrow, white ; stem 2–3 in. long, smooth, pallid, rooting.

Solitary, tough, inodorous. Differs from *C. protracta* in the large umbo.

On rotten wood, and on the ground near trunks.

*C. exsculpta*.—Cap 1–2 in. across, convex, umbilicate, tawny-brown ; gills closely crowded, sulphur-yellow ; stem about 1 in. long, clear sulphur-yellow.

Known from allied species by its toughness, and by the clear sulphur-yellow gills and stem.

On dead wood, etc.

*C. macilenta*.—Cap about 1 in. across, convex, then plane, smooth, dark yellow ; flesh yellow ; gills crowded, narrow, pure yellow ; stem about  $1\frac{1}{2}$  in. long, smooth, bright yellow, tough, slightly rooting.

Differing from every other species in the yellow colour throughout. Allied structurally to *C. esculenta*.

In pine woods, on leaves, etc.

*C. clavus*.—Cap 1–4 lines across, conically convex, then plane, somewhat papillate, smooth, shining, edge striate, orange-scarlet, disc darker ; gills white, rarely tinged yellow ; stem up to 1 in. long, slender, smooth.

The smallest species in the genus, distinguished by the bright-coloured cap. *Mycena acicula* differs in the yellow gills and rooting stem.

On twigs, etc.



*C. ocellata*.—Cap about  $\frac{1}{2}$  in. across, brown or yellowish, with a small, paler umbo; gills crowded, white; stem 1–1 $\frac{1}{2}$  in. long, brownish or yellowish, smooth, rooting.

Differs from *C. cirrhata* in the glabrous stem.

Among grass in pine woods. Dry and persistent.

*C. muscigena*.—Pure white. Cap 1–3 lines across.

Among moss, near stumps, etc.

2. *Gills greyish; hygrophanous.*

\* *Gills crowded, very narrow.*

*C. rancida*.—Smell strong. Cap 1–2 in. long, soon plane and umbonate, greyish black, becoming pale; gills dark grey; stem 3–6 in. long, smooth, livid, with a long downy rooting base.

Known amongst the strong-smelling species by the long rooting stem.

*C. coracina*.—Smell strong. Cap up to 1 $\frac{1}{2}$  in. across, brownish, then grey; gills greyish white; stem about 1 $\frac{1}{2}$  in. long, apex pale and mealy, with white squamules, rest brown, not rooting.

Among grass in woods.

*C. oers*.—Smell strong. Cap 1–1 $\frac{1}{2}$  in. broad, soon plane and umbonate, greyish brown, pallid when dry; gills smoky olive; stem 2 $\frac{1}{2}$ –4 in. long, wavy, smoky grey, apex with white meal.

On pine leaves, etc.

*C. inciens*.—Cap 1–2 in. across, soon plane and broadly umbonate, livid, pale tan when dry; gills greyish white; stem 2–4 in. long, wavy, livid, pale when dry, apex with white squamules.

On the ground in pine woods, etc.

*C. pleripes*.—Cap 1–2 in. across, campanulate and umbonate, not expanding, somewhat wrinkled and striate, blackish with a pale edge, then livid-sooty; gills free, very much narrowed behind, ventricose, white, then tinged green; stem about 3 in. long, shortly and abruptly rooting, hollow, livid.

Inodorous. Tough, firm, exactly the habit of a *Myrcia*, but from analogy nearest to *C. rancida*, from which it differs in the absence of smell, and from *C. protracta* in the free gills.

Among grass, near stumps, etc.

*C. aznata*.—Cap 1–1 $\frac{1}{2}$  in. across, expanded, pitch-black and shining when moist, brownish when dry; gills becoming brownish; stem up to 1 in. long, brown.

On the ground in sunny places, especially where fires have been.

*C. ambusta*.—Cap  $\frac{1}{2}$ –1 in. across, soon plane with a minute umbo, brown, then livid; gills crowded, tinged brown; stem about 1 in. long, brown.

On scorched ground. Cap often sooty brown.

Differs from *C. aznata* in the umbonate cap.



**\*\* Gills very broad, more or less distant.**

*C. lacerata*.—Cap about  $1\frac{1}{2}$  in. across, campanulate, streaked dark brown on a pale ground, disc darker; gills broad, greyish white; stem 2–4 in. long, twisted, fibrillose striate, brown.

Tufted. Cap often sooty brown, becoming pale and shining.

On the ground near trunks in pine woods.

*C. murina*.—Cap 1– $1\frac{1}{2}$  in. across, becoming expanded, rugulose or minutely squamulose, dark brown and pale when dry; gills becoming grey, very broad; stem 2–3 in. long, grey.

On the ground under oaks, etc.

*C. protracta*.—Cap up to 1 in. across, soon plane, greyish brown, shining, edge paler, and striate; gills very broad, grey; stem about 3 in. long, grey, rooting.

Distinguished by the very broad gills and rooting stem.

On the ground in pine woods.

*C. tesquorum*.—Cap up to  $\frac{1}{2}$  in. across, blackish brown, then pale; gills free, broad, pale greyish brown; stem up to 2 in. long, brown, apex pruinose.

Distinguished by the broad, free gills.

Among grass in sunny places.

*C. cluvilis*.—Cap  $\frac{1}{2}$ –1 in. across, umbilicate, livid, then pale; gills almost semicircular, pallid; stem  $1\frac{1}{2}$ –2 in. long, colour of the cap.

In woods.

*C. tylicolor*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. long, somewhat umbonate, bluish grey, powdered with white meal when young; gills free, broad, grey; stem about 1 in. long, grey, powdered with white meal.

Known by being entirely grey, and powdered with white meal, at least when young.

In woods.

*C. caldarii*.—Cap  $\frac{1}{2}$  in. across, hemispherical, umbonate, brown, wrinkled, not turning pale; gills adnato-decurrent, greyish; stem about 2 in. long, slender, paler than the cap.

On *Sphagnum* in an orchid house. Probably an introduced species.

*C. dorotheæ*.—Cap 1 in. and more across, at first globose and dark brown, then expanded and with a slight umbo, eventually depressed, pale brown, and grooved almost to the centre, covered with short white bristles; gills distant, white; stem 2– $2\frac{1}{2}$  in. long, slender, brownish above, pale below.

On a dead fern stem in a greenhouse. Probably an exotic species, introduced with the plant it was growing upon.

#### MARASMIUS

Cap regular, thin, tough; gills thin, pliant, variously attached, often connected by ridges or veins; stem central, cartilaginous or horny.

A very distinct genus, but difficult to define. It differs from its nearest allies, *Collybia* and *Myrcena*, by not deliquescing at maturity, but by drying up, and again assuming the original form when moistened. Some species have a smell resembling garlic or onions. Most species grow on wood, branches or leaves.

1. *Stem everywhere minutely velvety or downy* (showing best when dry).

*M. urens*.—Cap 2–3 in. across, tough, smooth, even, pinkish buff, or almostumber when moist, paler when dry; gills free, buff, then brownish; stem 2–3 in. long, pallid, everywhere covered with white down, base white, downy. Taste pungent.

The pungent taste separates it from *M. orcadæ*.

Woods and grassy places amongst fallen leaves. Tufted.

*M. peronatus* (Pl. XIII, fig. 6).—Very acrid. Cap convex, then almost plane, obtuse, opaque, often becoming depressed here and there, or lacunose, pale rufous with a tinge of brick-red, then tan-colour, 1–2 in. across; flesh thin, pliant; gills adnexed, then separating from the stem, thin, somewhat crowded, narrow, pallid, then with a rufescent tinge; stem about 2 in. long, thinner upwards, pale, downy above, at the base and for some distance up, with long, spreading down, varying in colour from yellowish white to clear canary yellow.

Allied to *M. urens*, but readily distinguished by the densely woolly or peronate lower portion of the stem.

In woods among fallen, damp leaves.

*M. porreus*.—Smell like garlic. Cap 1–2 in. across, thin, limp, edge striate, dingy yellowish, paler when dry; gills yellow, then pallid; stem up to 3 in. long, reddish brown, covered with white down.

*M. prasioides* agrees in the garlic smell, but differs in the glabrous stem.

Among fallen leaves, etc.

*M. orcadæ* (Pl. XIII, fig. 5) (fairy ring mushroom).—Cap 1–1½ in. across, somewhat umbonate when expanded, brownish, then tan, finally pale, tough; gills distant, pliant, pallid; stem 1½–2 in. long, whitish, covered with down.

Cap sometimes rufescent, becoming pale; gills often with a pink tinge.

In open pastures, often forming fairy rings. Edible.

*M. plancus*.—Cap ¾–1½ in. across, pliant, rufescent, then pale; gills distant, pale ochraceous brown; stem about 1½ in. long, pallid, and covered with white down.

Allied to *M. orcadæ*, differing in the narrower, darker coloured gills.

Woods and shady places.



*M. scorteus*.—Cap about  $\frac{1}{2}$  in. across, thin, tough, wrinkled, pallid or whitish; gills free, white; stem about  $1\frac{1}{2}$  in. long, white with a tinge of brown, apex pruinose, otherwise glabrous.

Resembling *M. oreades* in habit, but smaller, and with a nearly glabrous stem.

*M. wynneci*.—Inodorous. Tufted. Cap  $1-1\frac{1}{2}$  in. across, slightly umbonate, lilac-brown; gills distant, thick, pale lilac; stem  $1\frac{1}{2}-2\frac{1}{2}$  in. high, paler than the cap, minutely scurfy.

Among leaves, twigs, etc.

*M. erythropus*.—Cap about 1 in. across, wrinkled, pallid, almost white when dry; gills broad, not crowded, whitish; stem 2-4 in. long, blackish red, rather pruinose when dry, base with white down.

Differs from *Collybia acervata* in the broad, distant gills.

In beech woods among leaves, rarely on trunks.

*M. archyropus*.—Cap  $1-1\frac{1}{2}$  in. across, pale tan, then pale; gills crowded, narrow, pallid; stem 3-4 in. long, pale rufescent, everywhere covered with dense white down, scentless.

Among leaves, etc.

*M. torquescens*.—Cap about  $\frac{1}{2}$  in. across, thin, convex, then plane, rugosely striate, pallid, disc tawny; gills free, white with a tinge of red; stem about 2 in. long, slender, velvety or downy, brown, smooth and whitish at the top.

Known among species with a velvety stem, by the small whitish cap.

On twigs in woods, etc.

*M. alliaceus*.—Smell strong, resembling garlic. Cap thin, campanulate, then expanded, slightly umbonate, becoming striate, dry, brownish; gills at first joined to a collar and adnate, then free, brownish white; stem 3-5 in. long, minutely velvety, blackish.

Known by the strong smell and blackish, velvety stem.

Among fallen leaves, or on rotten wood.

*M. impudicus*.—Smell strong, foetid. Cap  $\frac{1}{2}-1$  in. across, reddish bay, pale when dry; gills soon free, white, with a tinge of pink; stem  $1\frac{1}{2}-2$  in. long, tough, wavy, rufous or purple-violet, entirely covered with white down when dry.

On or about rotten fir stumps.

*M. foetidus* (Pl. XIII, fig. 2).—Very foetid. Cap about 1 in. across, umbilicate, often wavy, tawny-bay or rufous; gills reddish, with a yellow tinge; stem about 1 in. long, bay, minutely pruinously velvety.

Smell very strong and unpleasant, but not like garlic.

On rotten branches.

*M. amadelphus*.—Cap 2-3 lines broad, pale reddish yellow, disc darker, then pale; gills broadly adnate, distant, pallid; stem up to  $\frac{1}{2}$  in. long, pallid, base bay, slightly pruinose.

On dead branches.



*M. ramealis*.—Cap 2–4 lines across, wrinkled, white, disc tinged brown ; gills adnate, rather distant ; stem up to  $\frac{1}{2}$  in. long, incurved, mealy or scurfy.

Differs from *M. amadelphus* in the whitish cap, and from *M. candidus* in the adnate, broad gills.

On dead bramble stems, twigs, etc. Gregarious.

*M. candidus*.—White. Much resembling *M. ramealis*, differing in being wholly white, and narrow gills.

On twigs, pine needles, etc.

*M. caudicinalis*.—Cap about  $\frac{1}{2}$  in. across, thin, becoming coarsely striate, tawny ; gills adnately decurrent, yellow ; stem  $1\frac{1}{2}$ –2 in. long, bay, paler upwards, minutely flocculose.

Distinguished by the yellow, slightly decurrent gills.

On pine leaves, etc.

*M. insititius*.—Cap about  $\frac{1}{2}$  in. across, slightly umbilicate, becoming grooved, pale yellowish brown, then whitish ; gills broadly adnate, pallid, then white ; stem about 1 in. long, horny, colour of cap, minutely scurfy, abruptly piercing the matrix like a pin stuck in.

On fallen leaves. Odourless.

*M. perforans*.—Smell very foetid. Cap 3–5 lines across, wrinkled, whitish, with a rufous tinge ; gills adnate, whitish ; stem 1– $1\frac{1}{2}$  in. long, tough, bay, then blackish, everywhere minutely velvety, abruptly piercing the matrix.

On pine leaves.

*M. hudsoni*.—Cap 1–2 lines across ; gills white ; stem pale ; cap and stem covered with spreading purple hairs.

On dead fallen holly leaves.

*M. saccharinus*.—Cap 1–2 lines broad, papillate, grooved, white ; gills broadly adnate ; stem  $\frac{2}{3}$ –1 in. long, reddish, minutely flocculose.

On slender twigs, dead leaves, etc.

*M. epiphyllus*.—Cap about  $\frac{1}{4}$  in. across, soon plane, umbilicate, wrinkled, white ; gills adnate, distant, white ; stem 1–2 in. long, slender, horny, bay below, minutely velvety.

On dead fallen leaves, twigs, etc. Gregarious.

*M. polyadelphus*.—Snow-white. Cap 1– $1\frac{1}{2}$  lines broad, striate ; gills decurrent ; stem  $\frac{1}{4}$ – $\frac{3}{4}$  in. long.



On rotten leaves. Densely gregarious.

2. Stem smooth or glabrous above, often densely woolly or downy at the base.

*M. prasiosmus*.—Smell strong of garlic. Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, pale dingy yellow or whitish ; gills white ; stem 2–3 in. long, brownish.

Differs from *M. porreus* in the white gills.

Among leaves in woods.

 *M. vatricosus*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, tough ; gills closely crowded, very narrow, tinged purple-brown, darker when dry ; stem 2–3 in. long, containing blood-red juice, base with tawny down. Inodorous.  Damp places among moss.

*M. fuscopurpureus*.—Cap  $\frac{2}{3}$ –1 in. across, dark purplish brown, tan when dry ; gills with a rufous or dingy lilac tinge ; stem 1–3 in. long, juiceless, blackish purple.

Among leaves, especially beech. Sometimes tufted.

*M. terginus*.—Cap about 1 in. across, dingy flesh-colour, whitish when dry ; gills crowded, narrow, pallid ; stem 2–3 in. long, pallid above, reddish below and running into a white rooting base.

Among fallen beech leaves, moss, etc. Tufted.

*M. scorodonius*.—Smell strong of garlic. Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, tough, rufous, then pale and wrinkled ; gills adnate, narrow, whitish ; stem 1–1 $\frac{1}{2}$  in. long, rufous.

On twigs, etc.

*M. calopus*.—Cap about  $\frac{1}{2}$  in. across, whitish ; gills rather distant, white ; stem about 1 in. long, shining, rufous. Odourless.

On twigs, roots of grass, etc.

*M. languidus*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, becoming umbilicate, grooved, white, tinged red or yellow ; gills narrow, white ; stem about 1 in. long, pallid.

Inodorous. Exactly the habit of a small *Omphalia*. Cap convex, umbilicate, edge grooved ; stem thickened upwards.

On twigs, dead grass, leaves, etc.

*M. rotula*.—Cap about  $\frac{1}{4}$  in. across, thin, umbilicate, whitish or disc darker ; gills few, broad, joined behind to a collar surrounding the stem ; stem 1–1 $\frac{1}{2}$  in. long, blackish.

Known at once by the gills being fixed to a collar surrounding, but free from the apex of the stem.

On fallen twigs, etc.

*M. graminum*.—Cap 4–6 lines across, umbonate, grooved, disc brown ; gills fixed to a collar round the stem ; stem 1–2 in. long, blackish, shining.

Differs from *M. rotula* in the umbonate cap.

On grass, leaves, etc.

*M. androsaceus*.—Cap up to  $\frac{1}{2}$  in. across, umbilicate, whitish ; gills adnate, whitish ; stem 1 $\frac{1}{2}$ –2 $\frac{1}{2}$  in. long, polished, blackish.

On dead leaves.

*M. spodoleucus*.—Cap 2–3 lines across, grey, shell-shaped, stemless ; gills few, white.

On dead elm twigs, etc.

*M. xerotoides*.—Cap thin, convex, then expanded, becoming umbilicate or depressed, edge remaining incurved for some time, then expanded and spreading, striate, umber, often with a tinge of



purple when moist, paler when dry,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, smooth; gills broadly and abruptly adnate, rather distant, whitish, then pinkish grey and powdered with the white spores; stem slender, stuffed, dark-coloured, velvety, base slightly thickened and surrounded by snow-white fibres of mycelium, up to 1 in. long. Inodorous (spores elliptical, smooth, colourless,  $5 \times 3 \mu$ ).

Somewhat resembling in general appearance small specimens of *M. fætidus*, but distinguished by the entire absence of smell. Also allied to *M. languidus*. Specimens collected in Mulgrave Woods during the Y.N.U. fungus foray, September, 1910, constituted the first British record of this species.

On wood, twigs, etc.

*M. vaillantii*.—Cap  $\frac{1}{2}$ –1 in. across, thin, pliant, soon plane and the disc depressed, marked with radiating ridges, whitish; gills adnate, broad, white; stem about 1 in. long, thickened upward, smooth, bay, the apex pale, penetrating the substratum.

Inodorous. Small, tough, dry. *M. impudicus* differs in the purplish stem becoming white and velvety when dry. *M. fætidus* differs in colour and in the strong smell.

On dead wood, fallen twigs, leaves, etc.

*M. splachnoides*.—Inodorous. Cap 4–6 lines across, membranaceous, convex, then expanded and umbilicate, smooth, striate, whitish, with a tinge of pale tan; gills slightly decurrent, crowded, simple, anastomosing, narrow, white; stem 1–2 in. long, slender, horny, smooth, shining, reddish or brownish, penetrating the matrix abruptly.

Size and habit of *M. perforans*, differing in the absence of smell, and the white, slightly decurrent gills.

On pine leaves, etc.

*M. curreyi*.—Cap convex, then plane, very thin, coarsely striate, pale rufous, the grooves paler, umbo tawny, 3–5 lines broad; gills few in number, attached to a collar round the stem, rather ventricose, cream-colour; stem about 1 in. long, slender, equal, quite smooth, shining, black, apex white.

Distinguished from other small species in this section by the pale rufous cap and cream-coloured gills.

On leaves of grass, etc.

*M. angulatus*.—Gregarious. Cap  $\frac{1}{4}$ – $\frac{1}{2}$  in. across, thin, hemispherical, then plane, becoming plicate and more or less angular, whitish with a tawny tinge; gills adnate, narrow, paler than the cap; stem 1–1 $\frac{1}{2}$  in. long, slender, greyish upwards.

*M. calopus* differs in the shining, bay stem. Closely resembling *M. curreyi* and *M. graminum*, the first differs in the ventricose gills, and the latter has the gills attached to a collar round the stem.

On grass, rushes, etc.



*M. rubricatus*.—Tufted. Cap about  $\frac{1}{4}$  in. across, convex, then plane, whitish, then tinged red or buff; gills adnexed, white, then brownish; stem  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, incurved at the base, hollow, sprinkled with delicate, mealy granules about half-way up.

On dead bramble stems, etc.

*M. actinophorus*.—Cap very thin, convex, then plane and umbilicate, pale bay-brown, with distant, darker, radiating lines, wrinkled when dry, 1–2 lines across; gills adnexed, narrow, whitish, alternate ones shorter; stem  $\frac{2}{3}$ –1 in. long, very slender, equal, paler than the cap.

Readily known by the brown cap marked with darker, radiating lines. Not striate.

On fallen twigs.

*M. epichloe*.—Cap very thin, 2–3 lines across, convex, then plane, papillate, not striate, whitish, disc bay-brown; gills rounded behind, rather crowded, broadest behind; stem about 1 in. long, slender, equal, bay, coarsely striate, the striæ setulose, base paler.

On dry grass stems, on spines of *Robinia*, etc.

#### LACTARIUS

Cap regular, usually rigid and fleshy, often more or less depressed and marked with concentric zones; gills adnate or decurrent, often branched; stem central, rarely excentric or lateral, stout. Every portion of the fungus exudes a quantity of white or coloured “milk” when broken.

The presence of this “milk,” or latex, is characteristic of the present genus, and clearly separates it from its closest ally, *Russula*. A few delicate species of *Mycena* contain latex which escapes in a liquid form when the fungus is bruised, but these are not likely to be mistaken for species of *Lactarius*.

Every part of the fungus tissue contains numerous anastomosing, laticiferous hyphæ, which are analogous to the laticiferous vessels met with in many flowering plants, and which liberate latex, or “milk,” when the tissue is broken, as in dandelion, lettuce, chelidonium, etc. These hyphæ are filled with a densely granular liquid latex—or “milk,” as it is termed by systematists, which escapes in drops when the tissue is broken. In the majority of species the latex is persistently white or milk-like, in some species the white milk changes colour on exposure to the air; whereas, again, in other species the latex is coloured from the first. Another peculiarity about the milk is that in some species it is hot or peppery to the taste; whereas in certain kinds the intense burning sensation experienced when a minute drop is touched by the tip of the tongue is something to remember. These peculiarities of colour and taste of the milk are of specific importance, and must be noted in any attempt to name a specimen. The milk is not poisonous in any species, only sometimes hot.

1. *Stem central. Gills not changing colour and not pruinose. Milk white at first, generally acrid.*

\* *Pileus viscid, edge incurved and downy at first.*

*L. scrobiculatus*.—Cap 4–8 in. across, becoming infundibuliform, viscid, yellow, then pale, zoned sometimes, edge incurved and shaggy at first; gills slightly decurrent, whitish; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, stout, yellow, viscid; milk white, changing to sulphur-yellow, very acrid.

In damp woods.

*L. intermedius*.—Cap 4–6 in. across, infundibuliform, viscid, ochraceous, edge involute and downy at first; gills slightly decurrent, lurid whitish, broad; stem  $1\frac{1}{2}$ –2 in. long, stout, yellowish, with spot-like depressions; milk white, then yellowish, rather acrid.

In woods.

*L. torminosus*.—Cap 3–4 in. across, viscid, depressed, slightly zoned, edge incurved and shaggy when young, pale flesh-colour with an ochraceous tinge; gills paler than the cap, slightly decurrent; stem up to  $3\frac{1}{2}$  in. long, stout, coloured like the cap or paler; milk permanently white, acrid.

Among grass, heather, etc.

*L. cilicioides*.—Cap 2–4 in. across, centre depressed, tomentose, not zoned, pale flesh-colour, with a fuscous tinge, edge incurved, woolly; gills decurrent, crowded, yellowish white; stem 2–3 in. long, stout, pallid; milk white, very slightly changing to yellow, acrid.

In woods and pastures.

*L. tabidus*.—Cap thin, soon expanded and depressed, with a small but distinct umbo in the centre of the depression, edge usually remaining slightly arched and distinctly striate, 1–2 in. across; every part reddish brown when moist, becoming paler when dry; gills soft, rather distant, not crowded; stem  $1$ – $1\frac{1}{2}$  in. long, thin, smooth; milk persistently white, almost or quite mild; spores globose-oblong, rough,  $8$ – $10 \times 6$ – $7 \mu$ .

Inodorous. It is somewhat remarkable that this species has not previously been met with in this country, as it is common throughout Europe. First found in this country at the Y.N.U. fungus foray at Mulgrave Woods in 1910. Readily known by the striate, umbonate cap.

On the ground among grass, etc.

*L. lateritoroseus*.—Cap up to  $3\frac{1}{2}$  in. across, soon depressed, squamulose, then smooth, flesh-colour or brick-red, with a rosy tinge; gills decurrent, becoming yellowish; stem up to 3 in. long, curved or wavy, paler than the cap; milk white, acrid.

In woods.

*L. turpis*.—Cap 3–7 in. across, becoming depressed, downy and



covered with olive gluten, becoming umber, edge yellowish olive and incurved when young; gills adnato-decurrent, pale straw-colour, brown when bruised; stem  $1\frac{1}{2}$ –3 in. long, olive; milk white, acrid.

Known by the olive tone of cap and stem.

In woods.

*L. controversus*.—Cap 3–5 in. across, convex, then depressed, whitish at first, then viscid, reddish and with red zones, edge strongly incurved when young; gills decurrent, with a tinge of flesh-colour; stem about 2 in. long, often excentric, stout, white; milk white, acrid.

In woods and pastures.

*L. pubescens*.—Cap 2–3 in. across, becoming depressed, zoneless, white, tinged flesh-colour, edge incurved, downy; gills adnato-decurrent, tinged flesh-colour; stem short, pale flesh-colour, then pale; milk white, very acrid.

Among grass.

*L. aspideus*.—Every part dingy straw-colour; stem and gills paler than the cap. Milk white, changing to lilac. Cap 2–4 in. across.

Differs from *L. uvidus*, which also has milk that changes to lilac, in the narrow gills and zoneless cap.

In damp meadows, etc.

\*\* *Cap with a viscid pellicle, edge naked.*

*L. utilis*.—Cap 5–8 in. across, depressed, tan-colour; gills adnate, crowded, pallid; stem 2–3 in. long, stout, coloured like the cap; milk white, rather acrid.

In woods.

*L. insulsus*.—Cap 3–4 in. across, becoming infundibuliform, rigid, zoned, smooth, yellowish brick-red, the viscid pellicle separating; gills decurrent, crowded; stem 1–2 in. long, pallid; milk persistently white, acrid.

Superficially resembling *L. deliciosus*, which differs in the red milk.

In pastures.

*L. zonarius*.—Cap 2–4 in. across, convex, then depressed, edge smooth, for a long time incurved, viscid, pale orange or pinkish yellow, often zoned; gills adnately decurrent, whitish, then dingy yellow, greenish when bruised; stem 2–3 in. long, whitish, then yellowish; milk white, acrid.

Among grass.

*L. fluens*.—Cap fleshy, convex, slightly viscid, blackish olive, scarcely zoned distinctly, not polished, edge pale, 3–4 in. broad; gills adnate or adnato-decurrent, at first ochraceous, then pale greyish ochre; stem solid, somewhat viscid, narrowed towards the



base, ochraceous olive ; flesh white, becoming greyish brown when broken ; milk copious, white, changing to brown on exposure to the air, acrid.

Allied to *L. blennius*, with which it has probably been confounded in this country.

On the ground in beech woods.

*L. blennius*.—Cap 3–5 in. across, firm, glutinous, greenish grey, often more or less zoned, with drop-like markings ; gills slightly decurrent, tinged ochraceous or whitish ; stem 1–2 in. long, stout, similar to cap in colour ; milk white, very acrid.

*L. turpis* differs in the darker olive-green cap and yellow down on the incurved edge.

In woods, etc.

*L. hyssginus*.—Cap 3–4 in. across, soon plane and umbilicate, viscid, reddish flesh-colour or brownish red, sometimes zoned and shining ; gills very slightly decurrent, pale, then ochraceous ; stem 2–4 in. long, rough with small points ; milk white, acrid.

Among grass in woods.

*L. trivialis*.—Cap 4–8 in. across, soon depressed, viscid, pale yellowish or pinky tan, not zoned ; gills subdecurrent, pallid ; stem 2–6 in. long, stout, slimy, pallid ; milk white, acrid.

Damp mossy places in pine woods.

*L. circellatus*.—Cap 2–4 in. across, soon depressed and usually wavy, viscid, rufous-brown, with darker zones, then paler ; gills adnate, tinged yellow ; stem  $1\frac{1}{2}$ –2 in. long, stout, pallid ; milk white, acrid.

Care must be taken to distinguish between this and *L. pyrogalus* and *L. flexuosus*.

In woods.

*L. uvidus*.—Cap  $1\frac{1}{2}$ –3 in. across, convex and sometimes slightly umbonate or gibbous, then depressed, viscid, pale ochraceous tan, not zoned ; gills slightly decurrent, white, becoming lilac when bruised ; stem 2–3 in. long, viscid, pallid ; milk white, changing to lilac, slightly acrid.

In woods.

\*\*\* Cap perfectly dry ; often downy or unpolished.

*L. flexuosus*.—Cap 3–5 in. across, soon depressed and wavy, opaque lead-colour or violet-grey, then pale ; gills adnate, yellowish, then tinged flesh-colour ; stem 2–3 in. long, stout, often excentric and lacunose, pale grey ; milk white, very acrid.

In woods.

*L. pyrogalus* (Pl. XIV, fig. 4).—Cap 2–3 in. across, soon depressed, livid grey and slightly zoned ; gills slightly decurrent, ochraceous ; stem about  $1\frac{1}{2}$  in. long, pallid ; milk white, very hot and acrid.

In woods and pastures.

*L. squalidus*.—Cap 1–2 in. across, pale greyish olive, not zoned ; gills adnate, pale yellow ; stem about 2 in. long, pale brown ; milk white, mild.

Differs from *L. pyrogalus* in pale yellow gills and mild milk.

Among moss in damp woods.

*L. capsicum*.—Cap  $1\frac{1}{2}$ –3 in. across, deep chestnut, edge strongly incurved ; gills slightly decurrent, pale tawny, with a golden tinge ; stem about 2 in. long, whitish, with tawny fibrils ; milk white, acrid.

On the ground under birches.

*L. chrysorrheus*.—Cap about 2 in. across, soon depressed, pale yellowish flesh-colour, with indistinct zones or spots ; gills decurrent, dingy yellow ; stem about  $1\frac{1}{2}$  in. long, white ; milk white, changing to golden yellow, acrid.

In woods.

*L. acris*.—Cap about 3 in. across, often excentric or irregular and obliquely infundibuliform, sooty grey, spotted sometimes, slightly zoned ; gills slightly decurrent, pallid, then pinkish yellow ; stem  $1\frac{1}{2}$ –2 in. long, stout, pallid ; milk white, soon becoming reddish, acrid.

Smell strong ; milk white, then reddish.

In woods.

*L. glaucescens*.—Cap fleshy, rigid, convex, then more or less plane and umbilicately depressed, smooth, even, dry, zoneless, white, then cream-colour, more or less spotted ochraceous white, edge inturned, 2–3 in. across ; gills adfixed, densely crowded, somewhat forked, narrow, whitish ; stem solid, firm, narrowed downwards, smooth, whitish, up to 2 in. long ; milk copious, white, changing to pale glaucous green.

Readily distinguished by the change in colour of the milk. Taste acrid.

On the ground in woods.

*L. umbrinus*.—Cap 2–3 in. across, soon slightly depressed, floccose, often wavy and excentric, olive-umber, paler and yellowish when dry ; gills slightly decurrent, pallid yellowish ; stem about 1 in. long, stout, a little paler than the cap ; milk white, forming grey spots where it escapes, acrid.

In pine woods.

*L. pergamenus*.—Entirely white ; cap 2–3 in. across, soon depressed ; gills adnate, very narrow, and closely crowded, becoming straw-colour ; stem 3–4 in. long, stout ; milk white, acrid.

Known by the very narrow, much crowded gills.

In woods.

*L. piperatus*.—Entirely white ; cap 4–8 in. across, becoming

## PLATE XIV

1. LACTARIUS VOLEMUS
2. „ DELICIOSUS
3. SECTION THROUGH CAP OF FIG. 2
4. LACTARIUS PYROGALUS
5. „ SUBUMBONATUS
6. „ VELLEREUS
7. „ RUFUS





PLATE XIV.





infundibuliform ; gills decurrent, crowded ; stem about  $1\frac{1}{2}$  in. long, solid ; milk copious, white, acrid.

In woods.

*L. vellereus* (Pl. XIV, fig. 6).—Entirely white ; cap 4–8 in. across, depressed, tomentose ; gills decurrent ; stem 2–3 in. long, stout, solid ; milk scanty, white, acrid.

Distinguished among the large white species by the tomentose or downy cap. Somewhat resembles *Russula delica*, differing in downy cap and acrid taste.

In woods.

*L. scoticus*.—Pallid white. Cap 1–2 in. across, soon almost plane and smooth except the incurved edge ; gills about 1 line broad ; stem about 1 in. long, slightly curved, tinged flesh-colour ; milk white, acrid.

Among moss.

*L. involutus*.—Much resembling *L. scoticus* in size and general appearance, differs in exceedingly narrow, densely crowded gills.

In woods.

2. *Stem central ; milk coloured from the first.*

*L. sangifluus*.—Blood-red. Cap fleshy, convex, then depressed, even, not zoned, 2–3 in. across ; gills thin, white ; stem spongy-stuffed, even, smooth, tapering upwards, paler than the cap ; milk copious, mild, blood-red (spores aculeate, globose, 10  $\mu$  diam.).

Differs from *L. deliciosus* in its smaller size, absence of zones on the cap, blood-red, and not reddish orange milk, and in not becoming green when old or bruised.

On the ground.

*L. deliciosus* (Pl. XIV, fig. 2).—Cap 3–5 in. across, soon expanded and depressed, edge incurved, dingy orange-red, zoned ; gills decurrent ; stem 1–2 in. long, stout ; milk deep orange. ¶

Every part abounding with saffron-red or deep orange, sweet-scented, acrid milk. Every part becoming stained with dingy green when bruised or old. Edible.

On the ground under firs, etc.

3. *Stem central. Gills pallid, becoming dark-coloured and powdered with white spores. Milk white, mild ; sometimes slowly becoming acrid.*

\* *Cap viscid at first.*

*L. pallidus*.—Cap 3–5 in. across, soon depressed, viscid, smooth, edge incurved, pale tan, not zoned ; gills slightly decurrent, paler than cap ; stem  $1\frac{1}{2}$ –2 in. long, stout, similar in colour or paler than cap, soon hollow ; milk white, mild.

In woods, especially beech.

*L. quietus*.—Cap 2–3 in. across, depressed, often wavy, viscid at first, dark reddish cinnamon, then pale, zones indistinct ; gills



decurrent, white, then pale brick-red ; stem 2-3 in. long, colour of cap ; milk white, mild.

In woods.

*L. aurantiacus*.—Cap  $1\frac{1}{2}$ -2 in. across, plane or depressed, golden-orange, not zoned ; gills decurrent, ochraceous ; stem up to 3 in. long, colour of cap ; milk white, acrid.

Differs from *L. mitissimus* in acrid milk and strongly decurrent gills, characters which also separate it from *L. volemus*.

In woods among grass.

*L. theiogalus*.—Cap  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. across, depressed, viscid, tawny-rufous ; gills pale, then rufescent ; stem 1-2 in. long, colour of cap ; milk white, then sulphur-yellow, becoming slightly acrid.

Agrees with *L. chrysorrhæus* and *L. capsicum* in the milk becoming yellow, but differs from both in the tawny-rufous stem.

In pine and other woods.

*L. cremor*.—Cap  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. across, smooth, viscid, tawny, minutely punctate, edge becoming striate ; gills adnate, white, then flesh-colour ; stem about  $1\frac{1}{2}$  in. long, colour of cap ; milk whitish, often watery, almost mild.

In woods, especially beech.

*L. vietus*.—Cap  $1\frac{1}{2}$ -2 $\frac{1}{2}$  in. across, plane and papillate, then depressed, viscid, flesh-colour or livid-greyish, becoming pale ; gills adnato-decurrent, yellowish with age ; stem 1-2 in. long, slender, colour of cap ; milk white, changing to grey, slightly acrid.

In woods. Soft, slender, fragile.

*L. cyathula*.—Cap 1-2 in. across, often plane and umbonate, then depressed, brick-red or flesh-colour ; gills decurrent, crowded, becoming yellowish ; stem about 2 in. long, pale ; milk white, acrid.

Damp ground under birches, etc.

\*\* Cap not viscid, squamulose downy or pruinose.

*L. rufus* (Pl. XIV, fig. 7).—Cap 3-4 in. across, umbonate, becoming depressed, but the umbo remains, rufous-bay ; gills adnato-decurrent, ochraceous, then pale rufous ; stem 2-3 in. long, rufescent ; milk white, very acrid.

In dry pine woods.

*L. helvus*.—Cap 2-4 in. across, expanded and umbonate, squamulose, brick-red with a yellow tinge, then pale ; gills decurrent, tinged flesh-colour, then yellowish ; stem 2-3 in. long, brick-red, then paler ; milk white, scanty, mild as a rule.

Damp mossy places in woods.

*L. tomentosus*.—Cap about 3 in. across, umbonate, then depressed, dingy flesh-colour or brownish ; gills decurrent, yellowish with a tinge of red ; stem about 2 in. long, pallid ; milk whitish, mild.

On the ground in swamps. Cap woolly sometimes.

narrowed downwards, viscid, whitish, apex granular,  $1\frac{1}{2}$ –2 in. long.

In woods.

*H. lividoalbus*.—Cap everywhere thin, expanded, obtuse, more or less wavy, even, smooth, viscid, livid, all one colour,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills decurrent, distant, clear white; stem nearly equal, often more or less wavy, whitish, smooth, 2–3 in. long.

Somewhat resembling *H. eburneus* in habit and size, differing in the livid colour of the cap and the smooth stem.

### CLITOCYBE

Cap normally symmetrical, generally fleshy at the disc or centre, and becoming thin towards the edge, pliant, mostly plano-depressed to infundibuliform, edge incurved; gills more or less decurrent or adnate; stem central, externally fibrous, somewhat elastic.

Differs from *Omphalia* in the stem being fibrous externally, and not cartilaginous and polished. *Collybia* differs in the same character and in the adnexed or almost free gills being rounded behind. *Tricholoma* differs in the sinuate gills.

The present genus is, I think, one of the most difficult to grasp thoroughly, and the various species require the greatest possible care in their determination.

### KEY TO THE SPECIES

GROUP I.—Cap fleshy, often becoming pale when dry, but not hygrophanous. Flesh firm, not watery, nor the flesh splitting into two layers. Differs from Group B in becoming pale and silky when dry.

#### A.—DISCIFORMES

Cap almost equally fleshy, convex, then plane or depressed, obtuse; gills at first adnate or adnato-decurrent. Normally solitary.

#### B.—DIFFORMES

Cap fleshy at the disc, edge thin, umbonate at first, then expanded and depressed, irregular. Gills unequally decurrent, long in some places, short in others, sometimes rounded or adnexed on one side, as in *Tricholoma*, but not sinuate. Stem somewhat cartilaginous outside, but fibrous. Tufted, often grown together at the base, form very variable. Sometimes quite solitary.

#### C.—INFUNDIBULIFORMES

Cap fleshy at the disc, becoming thin towards the edge, entirely infundibuliform or the centre deeply umbilicately depressed. Stem spongy, externally fibrous. Gills deeply and equally decurrent from the first. Cap often becoming discoloured or pale, but not hygrophanous.

## PLATE XVI

1. CLITOCYBE NEBULARIS

2. „ ODORA

3. „ GIGANTEA

4. „ TUBA

5. „ CYATHIFORMIS





PLATE XVI.





## D.—CYATHIFORMES

Flesh of cap thin (consisting of two separable sheets), disc not compact, hygrophanous, depressed, then cup-shaped ; gills adnate at first, then decurrent. Colour dingy when moist.

## E.—ORBIFORMES

Cap somewhat fleshy, hygrophanous, convex, then flattened or depressed, polished, not squamulose nor mealy ; gills plane, horizontal, crowded, thin, adnate or with a decurrent tooth. Colour dingy or watery, becoming pale.

## F.—VERSIFORMES

Cap thin, convex, then deformed, tough, more or less squamulose or scurfy ; gills adnate, broad, rather thick, for the most part thick and powdered with white from the spores.

## A.—DISCIFORMES

\* *Cap grey or brownish.*

*C. nebularis* (Pl. XVI, fig. 1).—Cap very fleshy, thick at the disc and thinning out to the edge, convex, often obtusely gibbous, greyish, soon pale and livid, smooth, 3–5 in. across ; gills slightly decurrent, crowded, rather narrow, white, then pallid ; stem stout, slightly thinner upwards, whitish, fibrillosely striate, firm, 2–3 in. long.

Cap clouded with grey or tinged brown, then often pallid. In large specimens, which reach up to 7–8 in. diameter, the cap is often wavy. Among the best and safest of edible fungi.

In woods, among dead leaves, etc.

*C. clavipes*.—Cap fleshy, convex, soon almost plane, at length often almost obconical, very obtuse, even, smooth, dry, sometimes all one colour, brownish, sooty or livid-grey, sometimes whitish towards the edge, rarely altogether whitish,  $1\frac{1}{2}$ –3 in. across ; gills deeply decurrent, running as lines down the stem, rather distant, soft, broad, persistently white ; stem conically narrowed upwards, rather fibrillose, livid-sooty, spongy, about 2 in. long.

Somewhat resembling *C. nebularis* in colour, but altogether smaller, and readily known by the much swollen base of the stem.

In woods, especially of conifers.

*C. comitalis*.—Cap fleshy, convex, then plane, obtuse, even, smooth, rather moist, but not hygrophanous, entirely sooty-umber, almost black, about  $1\frac{1}{2}$  in. across ; gills very slightly decurrent, thin, crowded, white ; stem equally narrowed upwards from the base, smooth, sooty, elastic, 2–3 in. long.

Known by the blackish colour of the almost flat cap, and the very slightly decurrent gills. Allied to *C. clavipes*, but smaller and firmer in texture, and differing in the gills being only slightly decurrent.



*C. gangrænosa*.—Cap fleshy, convex, then plane, obtuse, whitish, at first sprinkled with white powder, then naked and variegated, streaked, 2–3 in. across; gills slightly decurrent, crowded, dingy white; stem somewhat bulbous, soft, striate, solid, up to  $1\frac{1}{2}$  in. long.

Stinking; large, flesh becoming blackish or marbled with black. stem curved, sometimes excentric; cap at first whitish, here and there greenish, livid, etc., at length becoming jet-black.

On the ground in woods.

var. *nigrescens*.—Whitish; cap thin, soft, convex, then plane and somewhat depressed; gills decurrent, very much crowded, narrow; stem solid, downy.

Smell rather sweet. Taste unpleasant.

In larch plantations.

*C. polius*.—Cap very fleshy at the disc, convex, then plane, often obtusely gibbous when young, smooth, pale grey, not hygrophanous, 1–2 in. across; gills rather deeply decurrent, closely crowded, very narrow, white; stem slightly narrowed upwards, smooth, whitish, solid, 2–3 in. long.

Tufted; clusters sometimes small, at other times composed of numerous specimens having the stems grown together at the base; in such cases the cap is thinner and often wavy. Somewhat resembles states of *C. fumosa*, which differs in the sooty, then livid cap, mealy apex of the stem, and greyish white gills.

*C. inornata*.—Cap fleshy, plane or depressed, obtuse, even, smooth, cuticle separable, pale dingy greyish tan with an olive tinge, 3–4 in. across; gills slightly decurrent, crowded; stem stout, nearly equal, longitudinally wrinkled, firm, greyish, about  $1\frac{1}{2}$  in. long.

Not observed since Sowerby's time, and not well understood.

Among grass.

*C. hirneola*.—Cap thin, plane, then depressed, umbilicate, very even, shining, slightly viscid when fresh, minutely silky and hoary, about  $\frac{1}{2}$  in. across; gills slightly decurrent, crowded, thin, rather broad, greyish white; stem slender, equal, wavy, elastic, smooth, grey, apex with white meal, up to 2 in. long.

Small, gregarious, tough, but not hygrophanous. Only to be confounded with *C. gallinacea*, which differs in being wholly white, and stem at first floccosely mealy.

Among moss and grass by roadsides, etc.

var. *major*.—Cap  $1\frac{1}{2}$  in. across, wavy, whitish, and somewhat zoned.

\*\* *Cap violet or rufescent*.

*C. cyanophæa*.—Cap rather fleshy, convex, then plane, obtuse, smooth, brownish with a blue tinge; gills deeply decurrent, violet, becoming pale; stem narrowed upwards, bluish when young, base abruptly white, solid, smooth, about 3 in. long.

Somewhat resembling *Tricholoma nudum*, but distinct in the decurrent gills.

In woods, etc.

var. *pengelleyi*.—Differs from the typical form, more especially in having the stem narrowed at the base. The abrupt white apex of the stem is also remarkable in this variety.

*C. opiparia*.—Cap fleshy, plane, obtuse, even, smooth, shining, yellowish red, 2–4 in. across; gills slightly decurrent, crowded, whitish; stem more or less equal, whitish, solid, 2–3 in. long.

Smell not remarkable, taste pleasant. Cap rosy flesh-colour or fleshy tan-colour.

Among moss under trees, etc.

*C. amara*.—Taste very bitter. Cap fleshy at the disc, convex, then plane, obtuse, or sometimes slightly umbonate, dry, rufescent or yellowish tawny, slightly flocculose,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills slightly decurrent, crowded, white; stem tough, white, floccose, then almost smooth, solid, about 2 in. long.

A very distinct species, but the variable colour of the cap is liable to be misleading. Known without fail by the very bitter taste, along with its other characters.

On the ground under trees, etc.

*C. socialis*.—Cap fleshy at the disc, convex, soon expanded, rather acutely umbonate when young, usually obtuse with age, smooth, pale yellowish red or almost flesh-colour, about 1 in. across; gills very slightly decurrent, scarcely crowded, becoming yellowish; stem often slightly curved, smooth, solid, reddish, about 1 in. long.

Base of stem thickened and rooting, as in *Marasmius peronatus*; it is also very strigose.

*C. vernicosus* differs in the stuffed, yellowish stem, cap never umbonate, and bright yellow gills.

On heaps of fallen pine leaves.

\*\*\* *Cap becoming yellowish.*

*C. amarella*.—Smell strong, taste very bitter. Cap firm, somewhat umbonate, smooth, even, reddish yellow or pale fawn-colour, about 2 in. across; gills slightly decurrent, crowded, forked, pallid with a grey tinge, somewhat shining; stem equal, tough, base with white down, solid, about 2 in. long.

Taste very bitter; smell resembling prussic acid.

Among grass.

*C. vernicosa*.—Cap rather fleshy, convex, then expanded, depressed when old, even, smooth, deep shining yellow, edge incurved, 2–3 in. across; gills slightly decurrent, narrowed behind, rather distant, yellow; stem equal, even, smooth, yellow, about 1 in. long.

Superficially resembling *Tricholoma cerinum*, but easily distinguished by the gills being truly decurrent and not sinuate behind.

In larch woods, etc.



*C. venustissima*.—Cap convex, then plane, obtuse, edge even when young, then striate and crenulate, smooth, orange with a red tinge, becoming pale, 1–2 in. across ; gills decurrent, rather distant, coloured like the cap ; stem smooth but not polished, equal, reddish orange,  $1\frac{1}{2}$ –2 in. long.

Inodorous. More slender than *C. vernicosa*.

Among rotten pine leaves. Gregarious.

*C. subalutacea*.—Cap fleshy, soft, convexo-plane, then depressed, obtuse and unequal, smooth, yellowish, then pale, 1–2 in. across ; gills adnato-decurrent, broad, rather distant, whitish ; stem firm, elastic, smooth, about 2 in. long.

Stature of *C. venustissima* but firmer, and the stem longer. Smell weak, resembling aniseed, sometimes almost obsolete.

Among grass, etc., under trees.

\*\*\*\* *Cap greenish or pallid*.

*C. odora* (Pl. XVI, fig. 2).—Fragrant. Cap fleshy, tough and limp, soon plane and wavy, even, smooth, dull sage-green, silky when dry, about 2 in. across ; gills adnate, rather close, broad, tinged green or pallid ; stem pallid, elastic, base slightly thickened,  $1-1\frac{1}{2}$  in. long.

Colour varying from pale sage-green to verdigris-grey. Tough. Smell strong, spicy, resembling aniseed.

Among leaves, etc., in woods. Edible.

*C. trogii*.—Fragrant. Cap rather fleshy at the disc, convex, then expanded, obtuse, smooth, minutely silky, everywhere greyish white, dull and opaque, about 2 in. across ; gills slightly decurrent, crowded, whitish ; stem almost equal, whitish, base downy, about 1 in. long.

Agreeing with *C. odora* in the strong, spicy smell, but known by the dingy, pale grey, not green cap.

Among leaves, etc., in woods.

*C. rivulosa*.—Cap thin, convex, then plane and soon depressed, obtuse, often wavy or lobed, dingy flesh-colour or rufescent, becoming pale, smooth, then covered with whitish down, 1–3 in. across ; gills slightly decurrent, broad, rather crowded, pinkish white ; stem tough, rather fibrillose, whitish, about 2 in. long.

Variable in size and colour, hence not generally recognized ; solitary or tufted ; most vigorous in late autumn during rainy weather. Smell pleasant, taste sweet.

Among grass by roadsides, etc.

var. *neptuneus*.—Smaller than the typical form.

\*\*\*\*\* *Cap white, shining when dry*.

*C. cerrusata*.—Cap with a fleshy disc, convex, then almost plane, obtuse, even, minutely floccose, then almost smooth, white ; gills adnate, then decurrent, closely crowded, thin, permanently white ; stem tough, elastic, smooth, solid, white, about 2 in. long.



Entirely white, inodorous ; gills never tinged yellow.

Among heaps of dead leaves, etc.

var. *difformis*.—Tufted, often very large and the cap wavy or lobed, 2–7 in. across.

*C. phyllophila* (Pl. XVII, fig. 1).—Cap rather fleshy, convex, then plane, becoming umbilicate and depressed, sometimes wavy, smooth and even, whitish tan, 1–3 in. across ; gills thin, subdistant, white, then tinged ochre, rather broad, slightly decurrent ; stem equal, whitish, tough, silky-fibrillose, soon hollow, 2–3 in. long.

Cap becoming depressed, but never truly infundibuliform, often excentric and wavy, pale tan, then pallid white.

Among leaves in woods ; somewhat tufted.

*C. pithyophila*.—White. Cap thin, more or less plane and umbilicate, often wavy and lobed, hygrophanous, smooth, shining white when dry,  $1\frac{1}{2}$ –3 in. across ; gills slightly decurrent, crowded, persistently white ; stem equal, often compressed, white, smooth, base downy, imperfectly hollow, about 2 in. long.

Allied to *C. phyllophila*, but clearly distinguished by the persistently white gills and cap. *C. tuba* is often confounded with the present species, but differs in the deeply decurrent gills.

On the ground in pine woods, etc. Gregarious or slightly clustered.

*C. tornata*.—White. Cap with a fleshy disc, orbicular, flattened or somewhat depressed round the gibbous disc, becoming slightly downy and shining, 1–2 in. across ; gills adnate or very slightly horizontal, crowded ; stem equal, smooth but not polished, slightly striate, tough, about  $1\frac{1}{2}$  in. long.

Distinguished from allies by its small size and regular shape.

In woods, etc.

*C. candicans*.—Entirely white. Cap thin, convex, then plane or slightly depressed, umbilicate, regular or slightly excentric, even and adpressedly silky, shining white when dry, about 1 in. across ; gills adnate, then slightly decurrent, crowded, very thin, narrow, straight ; stem even, smooth, cartilaginous and polished, base downy, incurved and rooting, 1–2 in. long.

Small, rather tough, approaching *Omphalia* in the structure of the stem. Stem thin, often more or less wavy.

Among damp fallen leaves.

*C. dealbata*.—Cap thin, dry, tough, convex, then plane, becoming upturned and wavy, even, smooth, somewhat shining, at length minutely mealy, white, 1– $1\frac{1}{2}$  in. across ; gills adnate, scarcely decurrent, thin, crowded, white ; stem equal, often curved, white, apex mealy, entirely fibrous, about 1 in. long.

Cap orbicular or irregular and wavy. *C. ericetorum* differs in the distant, decurrent gills

In sunny places among grass, etc. Often occurring in mushroom beds. Solitary or tufted.

var. *minor*.—Smaller and more elegant than the typical form, pure white, opaque. Smell like meal.

Among dead leaves. Gregarious.

*C. gallinacea*.—White, taste acrid. Cap rather fleshy at the disc, becoming thin towards the edge, convex, then depressed, but not infundibuliform, even, dry, opaque, 1–1½ in. across; gills slightly decurrent, narrow, crowded, thin; stem solid but not cartilaginous, ascending or wavy, excentric, at first floccosely mealy, opaque, white, 1½–2 in. long.

Resembling *C. dealbata* in shape, but smaller, opaque, dingy white, and acrid to the taste. Smell strong.

Among grass, moss, etc., in woods.

## B.—DIFFORMES

*C. decastes*.—Cap soon becoming expanded and plane, gibbous or obtuse, edge at first inturned, then spreading, and usually irregularly waved or lobed, even, smooth, dingy brown or livid when moist, pale clay-colour when dry, 5–12 in. across; flesh very thin, except at the disc; gills adnato-decurrent or often more or less adnexed, often up to ½ in. broad, narrowed towards the edge, often wavy, whitish; stem stout, entirely fibrous, solid, usually curved, white, many stems usually coalescing into a solid mass at the base, 4–8 in. long.

Tufted; clusters sometimes containing 30–50 plants. Cap smoky brown or livid, shining as if oiled.

On the ground.

*C. subdecastes*.—Cap rather thin, bell-shaped or convex, even, smooth, disc pale ochraceous, becoming paler or whitish towards the more or less lobed margin, 1½–3 in. broad and high; gills adnate, slightly rounded behind, rather crowded, narrowed in front, white; stem stout, equal, fibrillose, whitish, 4–5 in. long, several stems usually grown together at the base.

Cap not becoming expanded, often irregular from mutual pressure.

On the ground. Densely clustered or tufted in habit.

*C. molybdina*.—Cap campanulate, then expanded and umbonate, edge thin, even, smooth, somewhat sooty grey or umber, paler towards the edge, 4–6 in. across; gills adnate, broad, pale yellowish salmon-colour; stem stout, solid, rather coarsely fibrous, pallid or tinged yellowish salmon-colour, base white, minutely squamulose above, 5–7 in. long.

Closely resembling a large specimen of *Pluteus cervinus*, for which it may easily be mistaken, and probably often is, unless special attention is paid to the adnate gills.

In woods. Often clustered.



*C. tabescens*.—Cap rather fleshy, convex or conico-campanulate, then expanded, and more or less umbonate or gibbous, tawny honey-colour or tinged brown, the disc more or less covered with darker squamules, 2–3 in. across; gills somewhat crowded, decurrent, tinged ochraceous flesh-colour; stem fibrillose squamulose, becoming almost smooth, pallid or dingy ochre, 3–5 in. long.

Growing usually in fairly dense tufts. Superficially very closely resembling *Armillaria mellea*, but there is no trace of a ring.

On the ground around stumps, etc.

*C. ampla*.—Cap fleshy at the disc, cartilaginous and tough when young, convex, then plane, somewhat gibbous, unequal, wavy, lax when old, smooth, rarely with longitudinal wrinkles or virgate, sooty when young and moist, then livid, hoary or silky when dry, 3–6 in. across; gills often rounded and more or less adnate in one part, and decurrent in another, broad, rather distant, serrulate, smoky horn-colour, then whitish; stem stout, often twisted, smooth, white, apex downy, up to 6 in. long, fibrous internally, surface somewhat cartilaginous.

Usually very large, often up to 9–12 in. across in exceptionally well-grown specimens.

In woods among moss, etc., gregarious or in small clusters.

*C. aggregata*.—Cap thin, flaccid, convex, then expanded, often gibbous, often wavy and irregular, minutely longitudinally wrinkled, greyish livid or pale yellowish rufescent, becoming pale, 2–4 in. across; gills unequally decurrent, crowded, broad, pinkish yellow or pallid; stem somewhat fibrillose, thinner at the base, pinkish yellow or whitish, several often grown together at the base.

Differs from *C. decastes* in the fibrillose stem, coloured gills, flaccid and often excentric cap.

In oak woods on the ground; on sawdust, etc.

*C. elixa*.—Cap fleshy at the disc, umbonate, then flattened or depressed, edge more or less wavy, downy and streaked, disc smoky buff, edge paler, marked with dingy spots, 2–4 in. across; gills decurrent, distant, whitish; stem stout, almost equal, coloured like the cap, 1–1½ in. long.

Solitary. Cap becoming pale and silky when dry.

On the ground in woods.

*C. fumosa*.—Cap with a fleshy disc, convex, often gibbous when young, regular or wavy, smooth, sooty brown, soon livid or grey when dry, 1–3 in. across; gills adnate when the cap is regular, but sometimes decurrent, crowded, distant, greyish white; stem often twisted and curved, smooth, dingy white, apex mealy, fibrous, 2–3 in. long.

Known from *C. elixa* by the obtuse cap, which is never virgate or streaked. Smell none.

In woods. Gregarious or somewhat clustered. Tough.



*C. tumulosa*.—Cap with a fleshy disc, conico-convex, then expanded, obtusely umbonate or obtuse, smooth, brownish umber, becoming pale, edge drooping, 1–2 in. across; gills more or less decurrent or slightly emarginate, crowded, narrow, white, then greyish; stem downy, pallid, solid, 3–5 in. long.

Readily known by the densely clustered habit and the umber cap. Gills variable, decurrent or rounded behind, and then suggesting a *Tricholoma*.

On the ground in woods.

*C. connata*.—Cap fleshy, becoming thin towards the edge, conical, then expanded and wavy, lobed or deformed, smooth, moist, obtusely umbonate, white or pallid, becoming clear grey towards the edge, 3–4 in. across; gills narrow, unequally decurrent; stem hollow, whitish, twisted.

Usually growing in dense clusters, the many stems springing from a common tuberous base. Cap sometimes shining white.

On the ground in damp woods.

*C. pergamena*.—Densely tufted. Cap convex, then plane, obtusely umbonate, smooth, even, pallid or parchment-colour, somewhat cartilaginous, 1–2 in. across; gills broadly adnate, with a decurrent tooth, rather crowded, white; stem equal, with a cartilaginous cuticle which often cracks up in patches, squamulose at the apex, whitish, 4–5 in. long.

Readily distinguished by the densely tufted habit, and growing on wood. The cartilaginous stem suggests *Omphalia*, but the gills are not decurrent.

On stumps, etc.

*C. opaca*.—White. Cap convex, then expanded, umbonate, often depressed round the umbo, wavy, minutely flocculose, opaque; gills adnate and subdecurrent, closely crowded, white; stem unequal, somewhat fibrillose, wavy,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long.

Differing from *C. cerrusata* mainly in the umbonate cap.

In woods. Solitary or tufted.

*C. occulta*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, flesh rather thick at the disc, running thin towards the edge, convex, then plane or depressed, even, smooth, but virgate or streaked, viscid, pallid, smoky at the disc, edge whitish; gills adnate and very slightly decurrent, narrow, white; stem  $1\frac{1}{2}$ –2 in. long, equal or slightly expanded into the cap, white, fibrillosely striate, often curved, solid.

Known by the viscid cap and the very slightly or not at all decurrent gills.

On charred ground. Gregarious.

*C. monstrosa*.—Cap rather fleshy, convex and umbonate, at length waved and lobed, white, opaque as if whitewashed, edge incurved,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills scarcely rounded behind, but not truly decurrent, rather distant, white or cream-colour; stem com-

pressed, streaked, opaque-white, slightly rooting, downy-squamulose above, up to 1 in. long.

On the ground. Often densely clustered.

### C. INFUNDIBULIFORMES

\* *Cap coloured, or becoming pallid, silky.*

*C. gigantea* (Pl. XVI, fig. 3).—Cap fleshy, but thin in proportion to the size of the fungus, depressed from the first, and becoming plano-infundibuliform, edge incurved, then spreading, rather coarsely striate, smooth, white or whitish tan, 6–10 in. across; gills slightly decurrent, broad, much-crowded, branched and connected by veins, whitish, then pale tan; stem 1–2 in. long, and nearly the same in thickness, solid, pallid.

Entirely whitish tan-colour; cap often excentric and lobed, sometimes up to 1 foot across.

On the ground. Often subcæspitose. Edible.

*C. maxima*.—Cap with a fleshy disc, remainder thin, broadly infundibuliform, somewhat umbonate at the base of the depression, flaccid, edge even, whitish or pale tan-colour, 6–9 in. across; gills deeply decurrent, rather crowded, soft, whitish; stem stout, slightly narrowed upwards, fibrillose, whitish, solid, 3–4 in. long.

Differs from *C. gigantea* in the deeply decurrent gills, cap more infundibuliform, with the umbo persistent at the bottom of the depression, and the longer stem.

Among grass in woods and pastures. Edible.

*C. infundibuliformis*.—Cap with the disc fleshy, remainder thin, firm when young, becoming flaccid, convex, then depressed with a gibbous umbo, edge incurved, finally infundibuliform, yellowish flesh-colour, then buff, becoming pallid, up to 3 in. across; gills decurrent, rather crowded, much narrowed at both ends, soft, white; stem firm, elastic, conically narrowed, rarely equal, pallid, 2–3 in. long.

Colour variable, more or less rufescent or flesh-colour, passing through buff to whitish. Not white at first.

Among moss in fields and woods. Smell pleasant.

var. *membranaceus*.—More slender than the typical form; cap not umbonate and brighter in colour.

In woods, etc.

*C. trullæformis*.—Cap infundibuliform, edge flat and spreading, obtuse, floccosely downy, dry, greyish brown, not changing colour, about 2 in. across, flesh snow-white; gills decurrent, distant, connected by veins, shining white; stem elastic, narrowed upwards, fibrillosely striate, grey, downy below, about 2 in. long.

Resembling *C. cyathiformis* in general shape and colour of the cap and stem, but differs in the white flesh and shining white gills.



Known by the rather distant gills, connected by veins, and the infundibuliform cap.

Among grass, bushes, etc.

*C. incilis*.—Cap thin, plane and umbilicate, then infundibuliform, silky-flocculose, almost brick-red, the incurved edge crenate, about 2 in. across; gills more or less decurrent, distant, connected by veins, white, then pallid, but not yellow; stem brick-red, fibrous, tough, unequal, hollow, about  $\frac{1}{2}$  in. long.

On the ground in woods, etc.

*C. sinopica*.—Cap thin, soon plane or slightly depressed, umbilicate, at first smooth, then flocculose, brick-red, then becoming pale, dry, about 1 in. across; stem equal, stuffed, rather fibrillose, coloured like the cap, 1–2 in. long.

*C. incilis* differs in the hollow stem, incurved and crenulate edge of cap, and distant gills connected by veins. Easily known by the strong smell of new meal.

In woods, chiefly on scorched ground, appearing in spring and summer.

*C. parilis*.—Cap plane, depressed at the disc, atomate, disc flocculose, not striate, greyish white, not hygrophanous, about  $\frac{3}{4}$  in. across; gills deeply decurrent, much crowded, narrow, greyish white; stem slender, smooth, greyish brown, tough, about 1 in. long.

On the ground in woods.

\*\* *Cap coloured or pallid, smooth* (not silky).

*C. geotropa*.—Cap thick, convex, then plane, finally more or less depressed and umbonate, the umbo remaining after the cap is depressed, smooth, even, edge incurved, downy, pale pinkish tan or buff, 2–5 in. across; gills decurrent, crowded, narrow, white, then coloured like the cap; stem stout, slightly narrowed upwards, fibrillose, solid, coloured like the cap or paler, 3–5 in. long.

Differs from *C. maxima* and *C. gigantea* in the smooth cap and firmer substance. Differs from *C. gilva* in the white flesh.

In woods and on their borders. Often growing in rings or troops.

*C. spinulosa*.—Closely resembling *C. geotropa* in size and general appearance, but readily distinguished by the globose, spinulose spores.

In *C. geotropa* the spores are elliptical and smooth.

Among grass by waysides. Gregarious.

*C. subinvoluta*.—Cap fleshy at the disc, convex, then depressed; obtuse, smooth, pale tan-colour or with a brick-red tinge, edge inturned, 2–3 in. across; gills broad, decurrent, pale tan; stem nearly equal, grooved, tinged reddish, solid, about 2 in. long.

*C. geotropa* differs in the umbonate cap, and *C. gilva* in the ochraceous flesh and closely crowded gills.

In fir woods, etc.

*C. gilva*.—Cap thin, soon depressed and often wavy, but not truly infundibuliform, obtuse, smooth, pale dingy ochraceous, 2–3 in. across; flesh of cap and stem pale ochraceous; gills decurrent, closely crowded, pallid, then ochraceous; stem smooth, solid, coloured like the cap, up to 1 in. long.

Distinguished by the ochraceous colour of every part, including the flesh. *C. splendens* differs in the white gills. *C. inversus* is known from the present species by its rufescent gills, and *C. flaccidus* differs in the thin, flaccid, infundibuliform cap, and somewhat wavy, longer stem.

In pine woods, etc.

*C. splendens*.—Cap rather thick, plane, then depressed or infundibuliform, smooth, shining, yellowish or gilvous, 2–3 in. across, flesh white; gills deeply decurrent, narrow, crowded, simple, white; stem smooth, coloured like the cap, solid, slightly thickened at the base, about 1 in. long.

Intermediate between *C. gilva* and *C. flaccida*. The former differs in the more compact cap, often with drop-like markings, and the very much crowded, somewhat branched, pale ochraceous gills and flesh. The gills of *C. splendens* have a yellow tinge when old.

In woods among pine leaves, etc. Solitary.

*C. inversus*.—Cap thin, fragile, convex, soon infundibuliform, edge inturned, smooth, even, rufescent or dull brownish orange, often wavy or deformed, 2–3 in. across; gills decurrent, simple, pallid, then rufescent; stem smooth, rather rigid, stuffed, soon hollow, paler than the cap, about 1½ in. long.

Gregarious or clustered, often forming large tufts, especially late in the autumn. Deformed. Smell slightly acid. Flesh coloured like the cap.

Among leaves in woods.

*C. flaccidus*.—Cap pliant, orbicular, umbilicate, umbo persistently absent, edge spreading, arched, smooth, even, or rarely cracked into squamules, tawny-ferruginous or rusty, shining, not becoming pale, 2–3 in. across; flesh thin, pallid; gills deeply decurrent, crowded, narrow, white, then tinged yellowish; stem elastic, polished, base thickened, downy, reddish rust-colour, 1–2 in. long.

Gregarious, stems often grown together at the base. Sometimes solitary and regular in shape.

Among leaves, etc.

var. *lobatus*.—Tufted; darker in colour; cap lobed or contorted at the edge.

*C. vermicularis*.—Cap slightly fleshy, umbilicate, then the edge becomes turned up and the cap becomes infundibuliform, wavy, even, smooth, red, then pinkish tan, very often undulately lobed at the margin, 1–2 in. across; gills decurrent, closely crowded, thin,



white; stem hollow and soon compressed, smooth and shining, white, about  $1\frac{1}{2}$  in. long.

In pine woods, etc.

*C. senilis*.—Cap thin, infundibuliform, smooth, often concentrically cracked, edge straight, spreading, dingy greyish tan-colour, about 2 in. across; gills decurrent, narrow, crowded, white, then the colour of the cap; stem equal, smooth, whitish, solid,  $1-1\frac{1}{2}$  in. long.

Colour difficult to describe, dingy clay-colour. Gills deeply decurrent in lines, very narrow, much crowded. Allied to *C. flaccida*, but differing in colour.

In pine woods, etc. Gregarious. Inodorous.

\*\*\* *Cap shining white.*

*C. catina*.—Cap fleshy at the disc, edge thin, plane, then infundibuliform, dry, smooth, white at first, with a tinge of flesh-colour in rainy weather, pallid or yellowish when dry and old, about 2 in. across; gills decurrent, crowded, white; stem white, elastic, solid, base slightly thickened,  $1\frac{1}{2}-3$  in. long.

Allied to *C. infundibuliformis*, having the same pleasant smell, but white at first, cap never gibbous, glabrous. *C. phyllophila* differs in the cap never being infundibuliform, slender stem, adnate gills and absence of smell.

Among dead leaves, etc.

*C. tuba* (Pl. XVI, fig. 4).—Cap thin, convexo-plane, umbilicate, even, whitish when moist, shining white when dry, somewhat hygrophanous, smooth, but at first silky here and there from remains of the veil, 2-3 in. across; gills deeply decurrent, closely crowded, white, then pallid; stem equal, very tough, at length compressed, white, apex naked, about 2 in. long.

Very similar to *C. pithyophila*, of which it may possibly be a form with an umbilicate cap, and deeply decurrent gills narrowed behind.

In pine woods, etc. Entirely white. Appearing late in the season.

*C. ericetorum*.—Cap with a fleshy disc, at first almost globose, then depressed and more or less top-shaped, smooth, even, white, shining when dry, about 1 in. across; gills slightly decurrent, distant, rather broad, connected by veins, white; stem smooth, tough, thinner at the base, white, about 1 in. long.

Resembling *Hygrophorus niveus* in general appearance, but very distinct in structure. The present species is dry, soft, elastic; smell pleasant.

#### D.—CYATHIFORMES

*C. cyathiformis*.—Cap thin, plano-depressed when young, then infundibuliform, even, smooth, hygrophanous, rather slimy, and usually dark brown when moist, becoming pale and opaque when dry, often wavy when large, edge intumed for a long time,  $1\frac{1}{2}-3$  in.

across ; flesh watery, coloured like the cap, splitting into two layers ; gills adnate, becoming decurrent with the depression of the cap, joined behind, distant, greyish brown, sometimes branched ; stem elastic, at length often hollow, narrowed upwards, brownish fibrillose, coloured like the cap or a little paler, apex naked, 2-4 in. long.

Usually blackish umber, but varies to paler greyish brown, pinky tan, pale cinnamon, etc.

On the ground in pastures and woods ; rarely on rotten wood.

var. *cinerascens*.—Cap up to 1 in. across, thin, infundibuliform, pale smoky brown, gills decurrent, yellowish white ; stem greyish, reticulately fibrillose below, 1-2 in. long.

Among moss, etc.

*C. expallens*.—Cap convex, then expanded, obtuse, even, greyish brown, at first hoary with a superficial silkiness, becoming plane to infundibuliform, livid, the very thin edge striate, 1-2 in. across ; gills decurrent, narrowed at each end, thin, crowded, soft, greyish white ; stem equal, smooth, apex silky, white, soon hollow, tough, about 2 in. long.

Smaller, appearing earlier in the season, and paler in colour than *C. cyathiformis*. Watery, very hygrophanous, cap whitish or pale tan when dry.

In pastures, woods, etc.

*C. obbata*.—Cap thin, umbilicate, then infundibuliform, smooth, hygrophanous, edge becoming slightly striate, blackish or sooty brown, about 1 in. across ; gills decurrent, narrow, distant, at first dark grey, then powdered with white from the spores ; stem equal, tough, smooth, often wavy, hollow, greyish brown, about 2 in. long.

Distinguished by the distant, grey gills, powdered with white spores as in *Laccaria laccata*.

In pine woods, etc.

*C. pruinosa*.—Cap thin, umbilicate, then infundibuliform, almost even, pruinose at first, then smooth, about 2 in. across ; gills slightly decurrent, crowded, narrow, whitish, then dingy ; stem equal, fibrillose, coloured like the cap, about 1½ in. long.

Slender, rigid, inodorous ; stem often curved, fibrillose.

Pine woods among moss, and on trunks.

*C. concava*.—Cap very thin, broadly and deeply umbilicate, somewhat pierced at the base of the umbilicus, edge convexo-plane, wavy, hygrophanous, dark grey, 1-2 in. across ; gills decurrent, crowded, narrow, smoky grey ; stem equal, smooth, stuffed, grey, 1-1½ in. long.

A very well-marked species, entirely smoky grey. Cap very thin, flaccid. Distinguished from *C. ditopa* by the absence of smell.

In pastures, woods, etc.



*C. brumalis*.—Cap thin, soon expanded, umbilicate, then infundibuliform, and usually variously waved and lobed, smooth, flaccid, hygrophalous, livid, whitish or yellowish when dry, disc often darker, about 1 in. across; gills decurrent, narrow, crowded, pallid; stem nearly equal, slightly curved, smooth, whitish, often compressed, imperfectly hollow, up to 2 in. long.

Truly autumnal, being most abundant in November. Sometimes entirely watery white.

In woods, etc.

*C. obscurata*.—Cap plane, then depressed or funnel-shaped, moist, greyish umber, paler towards the edge, 2 in. across; gills decurrent, rather distant, white; stem solid, smooth or slightly striate, slightly narrowed downwards, never clavate, colour of cap, about  $1\frac{1}{2}$  in. long.

Odour of meal.

Among grass and dead leaves, etc.

#### E.—ORBIFORMES

\* *Gills grey or olive*.

*C. orbiformis*.—Cap thin, convex, then plane, very obtuse, not distinctly depressed, orbicular, smooth, smoky grey, hygrophalous, edge spreading, even, about 2 in. across; gills adnately decurrent, rather distant, broad, greyish white; stem equally narrowed upwards from the thickened, downy base, tough, somewhat striate, grey, naked upwards, fibrous outside, elastic, about 3 in. long.

Grassy places in pine woods, etc.

*C. metachroa*.—Cap thin, convex at first, soon plane or slightly depressed, brownish grey when moist, then livid, whitish when dry, edge even, or slightly striate when old, 1–2 in. across; gills adnate or scarcely decurrent, crowded, narrow, thin, greyish white; stem soon hollow and compressed, equal, tough, fibrous outside, grey, apex with white meal, about  $1\frac{1}{2}$  in. long.

Very variable, but easily recognized by the following points: smell none, apex of stem mealy, cap convex, then plane or depressed, gills greyish white.

In dry pine woods, etc.

*C. zygophylla*.—Cap fleshy at the disc, thin elsewhere, convex, then expanded, disc often slightly depressed, tough, flaccid, hygrophalous, with a greyish tint when moist, pale ochraceous white when dry, 2–4 in. across, edge thin, incurved at first, rugose or plicate, as if pinched up at regular intervals; gills deeply decurrent, rather distant, connected by veins, grey; stem equal, slightly curved, smooth, white, base downy, about 2 in. long.

Readily known among the grey-gilled species by the deeply decurrent gills connected by veins, and the puckered edge of the cap.

Among leaves in woods, etc. Rare.

*L. mammosus*.—Cap 2–3 in. across, acutely umbonate, downy, pale greenish grey ; gills adnate, whitish, then tinged brown ; stem 2–3 in. long, pallid, often with a tinge of pink ; milk white, becoming acrid.

The cap often becomes depressed and the umbo disappears. Inodorous.

In woods.

*L. glyciosmus*.—Strong-scented. Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, umbonate, greyish or brownish, squamulose, gills slightly decurrent, pale ochraceous ; stem about 1 in. long, pallid ; milk white, mild at first.

Smell strong, pleasant.

In woods, especially pine.

var. *flexuosus*.—Cap depressed, wavy, more or less zoned. Smell pungent, like spirit-of-wine.

*L. fuliginosus*.—Cap 2–4 in. across, often irregular or wavy, pale tan sprinkled with blackish down, rather velvety ; gills becoming decurrent, yellowish ochre ; stem up to 3 in. long, glabrous, pale, then darker ; milk white, changing to saffron, slightly acrid.

In woods.

*L. ligniotus*.—Cap 2–3 in. across, umbonate, wrinkled, sooty umber, rather velvety ; gills snow-white, then tinged ochre ; stem 3–5 in. long, velvety, colour of cap ; milk white, then reddish to saffron.

Differs from *L. fuliginosus* in velvety stem.

Among damp moss under fir trees, etc.

*L. retisporus*.—Cap 2– $3\frac{1}{2}$  in. across, slightly velvety, wrinkled, dark smoky brown ; gills deeply sinuate, pale ochraceous ; stem  $1\frac{1}{2}$ –2 in. long, paler than cap ; milk white, then brown, mild.

Distinguished from allies by the mild milk.

On the ground under beeches.

*L. picinus*.—Cap about 3 in. across, minutely velvety, becoming smooth, umber or blackish umber ; gills adnate, ochraceous ; stem 2–3 in. long, paler than the cap ; milk persistently white, acrid.

Readily distinguished amongst the species with a dark, minutely velvety cap, by the acrid, persistently white milk.

In dried-up swamps, in pine woods, etc.

*L. lilacinus*.—Cap 1–2 in. across, rosy lilac, not zoned, floccose when dry ; gills pallid with a pink tinge ; stem about 1 in. long, pallid with a white bloom ; milk white, acrid.

In damp woods.

*L. spinulosus*.—Cap about  $1\frac{1}{2}$  in. across, umbo acute, clad with minute erect spines, often zoned, flesh-colour, brick-red or rosy lilac ; gills decurrent, yellowish ; stem 2–3 in. long, wavy, colour of cap or paler, shining ; milk white, hot.

On the ground.

var. *violaceus*.—Cap rosy-violet, edge incurved.



\*\*\* *Cap smooth, polished.*

*L. volemus* (Pl. XIV, fig. 1).—Cap 3–5 in. across, plane or depressed, golden-tawny, often minutely cracked; gills decurrent, white, then yellowish; stem 2–3 in. long, solid, colour of cap; milk white, mild.

Allied to *L. quietus* but distinguished by the brighter colour of cap and stem, and white flesh.

In woods.

*L. ichoratus*.—Cap 3–4 in. across, thin, plane or depressed, often excentric, tawny-brick-red zoned with brick-red, disc often brown; gills adnate; stem  $1\frac{1}{2}$ –3 in. long, tawny then rufescent; milk white, sweet.

More slender in build than *volemus*, and the cap is zoned.

In woods.

*L. serifluus*.—Cap 1–2 in. across, soon depressed, often wavy, edge incurved, tawny brown; gills slightly decurrent, yellowish; stem about 2 in. long, colour of cap or paler, solid; milk scanty, watery, insipid.

Smaller and more slender, and stem solid, distinguishing points from *L. subdulcis*.

Damp ground.

*L. mitissimus*.—Cap 1–3 in. across, often depressed, rather glutinous when moist, bright tawny-orange, shining; gills a little paler than cap; stem 2–3 in. long, colour of cap; milk white, mild.

Differs from *L. subdulcis* in the bright, shining, golden-tawny colour of the cap and stem. *L. aurantiacus* differs in having acrid milk.

*L. subdulcis*.—Cap up to  $2\frac{1}{2}$  in. across, papillate, then depressed, rufous cinnamon or bay, smooth, zoneless; gills adnate, paler than the cap; stem  $1\frac{1}{2}$ –2 in. long, becoming hollow; milk white, mild at first, then with a trace of acidity.

Cap may be bay, rufous or cinnamon, not becoming paler.

In woods.

*L. camphoratus*.—Cap 1–2 in. across, depressed, brown with a brick-red tinge, indistinctly zoned; gills pale yellowish brick-red; stem about 1 in. long, colour of cap; milk white, mild; smell strong and fragrant, especially when dry.

Distinguished from all other species by the strong smell of melilot, which develops during drying.

In woods.

*L. cemicarius*.—Cap 1–2 in. across, plane or more or less depressed, edge often wavy, dark bay-brown; gills dingy ochre with a red tinge; stem about 1 in. long, paler than the cap; milk white acrid.

Smell strong and heavy.

The strong smell is said to resemble that of bugs, and disappears on drying. Differs from *L. camphoratus* and *L. subdulcis* in the acrid milk.

In woods.

*L. subumbonatus* (Pl. XIV, fig. 5).—Cap about 1 in. across, umbonate, often wavy and pitted, dark cinnamon; gills rufous-flesh-colour; stem about 1 in. long, colour of cap; milk white, mild; odourless when fresh, but with a strong, unpleasant smell when dry.

On the ground.

*L. obnubilus*.—Cap about 1 in. across, papillate, then umbilicate, sooty brown; gills yellowish; stem about  $1\frac{1}{2}$  in. long, paler than cap; milk white, acrid.

In woods.

#### 4. *Stem excentric or lateral.*

*L. minimus*.—Cap about  $\frac{1}{2}$  in. across, umbonate, excentric, pallid tan; gills pallid; stem up to  $\frac{1}{4}$  in. long, coloured like the cap; milk white, mild.

In pastures and woods.

*L. obliquus*.—Cap about 2 in. across, depressed, oblique, white, then yellowish and zoned with grey; gills white; stem about 1 in. long, excentric, colour of cap.

Tufted, slender, fragile, smell strong, cap deformed.

On trunks, banks, etc.

### HYGROPHORUS

Cap regular, often wavy and lobed at the edge, viscid or moist; gills variously attached, free, adnexed, adnate, etc.; waxy, often thick and forked, but the edge always thin and sharp; stem central.

A very natural genus, yet technically appearing to belong to several genera, in the varied mode of attachment of the gills. Brilliant colours are not uncommon. Many species are viscid or glutinous. The gills are usually distant, waxy, thick, but with a sharp thin edge, in fact resembling the blade of a razor. A main feature by which the genus can be recognized is that the hymenial layer becomes soft, and can easily be rubbed off the trama or central portion of the gill.

All the species grow on the ground, often in open places. Several species are edible.

#### Sub-genus I—HYGROCYPE

Veil absent, whole plant slender, watery, fragile. Cap viscid when moist, shining when dry, rarely floccosely scaly; stem hollow, soft, smooth; gills soft. Most species brightly coloured.



## Sub-genus II—CAMAROPHYLLUS

Veil absent ; cap firm, opaque, not viscid, but moist in rainy weather ; gills distant, arcuate ; stem even, smooth or only slightly fibrillose.

## Sub-genus III—LIMACIUM

Universal veil on the cap, viscid, partial veil floccose or downy, often forming a trace of a ring on the stem or attached to the edge of the cap ; stem squamulose or with wart-like squamules near the apex ; gills adnato-decurrent.

## Sub-genus I—HYGROCYPE

\* *Gills decurrent or adnate.*

*H. colemannianus*.—Cap rather fleshy, campanulate, then expanded and strongly umbonate, reddish umber, paler except the disc when dry, slightly striate and viscid when moist, up to 2 in. across ; gills deeply decurrent, connected by veins, thickish, distant, pale brownish ; stem nearly equal, often curved, rather silky, pale, solid, 1–1½ in. long.

The gills are sometimes umber, but paler than the cap.

Among grass.

*H. fæstens*.—Very foetid and nauseous. Cap convex, at length expanded and sometimes slightly depressed, dry, umber, becoming more or less broken up and cracked, about 1 in. across ; gills decurrent, grey ; stem olive-yellow, fibrously squamulose, 1–1½ in. long.

Known by its small size, umber cap and abominable smell.

Among grass.

*H. sciophanus*.—Cap fleshy at the disc, hemispherical or obtusely campanulate, then expanded, always obtuse, rather viscid, deep tawny or deep brick-red, opaque, very hygrophanous, pale when dry, ½–1½ in. across ; gills adnate, narrowed behind, distant, coloured like the cap, or sometimes with a tinge of rose-colour ; stem thin, equal, wavy, smooth, shining, paler than the cap, 1½–3 in. long.

A very beautiful fungus. Densely gregarious, fragile, deep tawny, stem paler or whitish, never straight.

Among grass and moss.

*H. lætus*.—Cap convex, then expanded, obtuse, slimy, tawny, shining, not becoming pale, about 1 in. across ; gills somewhat decurrent, distant, thin, slightly connected by veins, generally flesh-colour, but varying to white, smoky, etc. ; stem equal, tough, smooth, slimy, hollow, tawny, 2–3 in. long.

Among grass, moss, etc.

*H. vitellinus*.—Cap smooth, viscid, deep lemon-yellow, whitish when dry, edge plicato-striate, ½–1 in. across ; gills deeply decurrent,

rather distant, deeper coloured than the cap ; stem even, smooth, pale yellow, very fragile, hollow, usually wavy, whitish when dry, about 2 in. long.

Somewhat resembling *H. ceraceus*, differing in the deeply decurrent gills, bright lemon-yellow, becoming whitish when dry, and plicate edge of the cap.

Among grass in fields, etc.

*H. ceraceus*.—Cap convex, then expanded, obtuse, slightly viscid, fragile, waxy yellow and shining, pellucidly striate, about 1 in. across ; gills slightly decurrent, almost triangular, broad, yellow ; stem often unequal and wavy, smooth, hollow, coloured like the cap, 1–2 in. long.

Fragile. Readily known from all other species by the unchangeable, wax-yellow colour.

In pastures.

*H. coccineus*.—Cap convex, then plane, often irregular, at first viscid, even, bright crimson, then pale, 1–2½ in. across ; gills broadly adnate, with a decurrent tooth, distant, connected by veins, soft and watery, base purplish, middle pale yellow, edge glaucous when adult ; stem often flattened, not slimy, crimson above, base always pale yellow, hollow, about 2 in. long.

Size very variable. Differs from *H. puniceus* in the broadly adnate gills and yellow base of stem, and from *H. miniatus* by its larger size, yellow base of stem, and glabrous cap.

Among moss and grass in open places.

*H. miniatus*.—Cap convex and obtuse, then umbilicate, at first even, smooth, crimson, becoming pale and squamulose, ½–1 in. across ; gills adnate, not at all decurrent, distant, rather thick and firm, yellow or sometimes tinged crimson ; stem smooth, shining, crimson, 1½–2 in. long.

Very fragile. Much smaller than the other red species. Cap umbilicate, bleached and squamulose when old.

Among grass in pastures, woods, etc.

*H. citrinus*.—Cap up to 1 in. across, becoming expanded, citron-yellow, viscid, edge striate ; gills adnato-decurrent, yellowish white ; stem up to 1 in. long, solid, viscid, yellowish downwards.

Distinguished by the citron-yellow cap with darker coloured striae, and the viscid, solid stem.

On the ground.

*H. reai*.—Cap up to 1 in. across, becoming plane, scarlet, edge yellowish ; gills broadly adnate, broad, flesh-colour, then orange, edge yellow ; stem 1½–2½ in. long, viscid, orange-scarlet to yellow.

Distinguished by its bitter taste and viscid stem from *H. coccineus*, *H. miniatus* and *H. turundus*.

In pastures.



## PLATE XV

1. HYGROPHORUS PRATENSIS
2. VOLVARIA VOLVACEA
3. ECCILIA ATROPUNCTA
4. HYGROPHORUS PRATENSIS
5. „ CONICUS
6. LEPTONIA CHLOROPOLIA
7. HYGROPHORUS OBRUSSEUS
8. „ PSITTACINUS
9. „ PUNICEUS



PLATE XV.





*H. turundus*.—Cap convex, then expanded and depressed or umbilicate, covered with greyish brown down, then squamulose, edge incurved, crenulate,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across ; gills decurrent, white, then yellowish ; stem slender, rigid, equal, shining, tawny, about  $1\frac{1}{2}$  in. long.

Very fragile. Cap golden and viscid at first, soon broken up into downy floccose fibrils.

On the ground among moss, etc.

var. *mollis*.—Cap golden yellow with short, spreading fibrils of the same colour ; stem yellow with a red tinge, base white.

On naked soil.

*H. mucronellus*.—Cap conical, then campanulate, acutely umbonate, edge sometimes upturned, smooth, bright red, becoming pale,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across ; gills decurrent, triangular, thick, yellow ; stem coloured like the cap, base white, about  $1\frac{1}{2}$  in. long.

Known by the acutely umbonate cap and decurrent, triangular gills. Stem usually curved.

Among grass.

*H. micaceus*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, hemispherical, then expanded and slightly depressed, at first yellow, then grey with a tinge of green, wrinkled and sprinkled with glistening particles ; gills decurrent, narrow, pale umber ; stem yellow, then brown below, granulated, solid,  $\frac{2}{3}$ –1 in. long.

On clay soil. Rare.

*H. wynnii*.—Cap convex, umbilicate or somewhat infundibuliform, striate, hygrophanous, lemon-yellow,  $\frac{1}{2}$ –1 in. across ; gills decurrent, narrow, thin, yellowish, then with a green tinge ; stem smooth, coloured like the cap, about 1 line long.

Lemon-yellow, changing to a greenish tint as it dries.

On chips, among twigs, etc.

\*\* *Gills adnexed, separating from the stem and becoming free.*

*H. puniceus* (Pl. XV, fig. 9).—Cap at first campanulate, obtuse, usually wavy and lobed, usually irregular, even, smooth, viscid, deep crimson or blood-red, becoming pale, 2–4 in. across ; gills broad, thick, distant, yellowish white or pale yellow, often tinged red at the base, almost free ; stem stout, usually widest at the middle, apex generally squamulose, yellowish or coloured like the cap, base always white, about 3 in. long.

The largest species of the genus. Very showy. Differs from *H. coccineus* in [slightly [adnexed] gills and striate stem with a white base.

In mossy pastures.

*H. obrusseus* (Pl. XV, fig. 7).—Cap campanulate, then expanded, wavy, often lobed at the edge, dry, smooth, golden sulphur-colour, 2–3 in. across ; gills adnexed, then separating from the stem, very



broad, distant, whitish ; stem sulphur-yellow, smooth, hollow, 2-3 in. long.

Always golden sulphur, never red ; base of stem sometimes tawny. Firmer than allied species.

Grassy places in woods.

*H. intermedius*.—Cap campanulate, then expanded, obtuse or with an indication of an umbo, edge often wavy, golden yellow, then greyish, up to 2 in. across ; gills adnate, narrowed in front, distant, whitish, then yellow ; stem fibrillosely striate, hollow, yellow, 2-3 in. long.

Remarkable for the smell of meal. Differs from *H. obrusseus* by the cap becoming grey and the mealy smell.

Among grass.

*H. conicus* (Pl. XV, fig. 5).—Cap acutely conical, edge lobed, becoming cracked and turned up, smooth, viscid when moist, shining when dry, yellow, sometimes more or less tinged crimson, becoming black with age or when bruised, 1-2 in. high ; gills almost free, rather crowded, thin, yellowish ; stem fibrously striate, yellow, 3-4 in. long.

Every part turning black when old, or the plant is bruised. Orange, yellow or scarlet, or the colours mixed on the same cap in various proportions.

Among grass in pastures, etc.

*H. calyptræformis*.—Cap acutely conical, then expanded, then splitting the edge, much upturned, pale clear rose-colour, becoming pale with age,  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. high ; gills slightly adnexed, rather distant, pale rose-colour, then whitish ; stem white, fragile, hollow, 3-4 in. long.

A very beautiful species ; fragile. Does not become darker when old, as in *H. conicus*.

var. *niveus*.—Entirely snow-white.

Among grass in open places.

*H. chlorophanus*.—Cap convex, then plane, orbicular, very fragile, lobed, smooth, viscid, striate, not changing colour, usually bright sulphur-yellow, sometimes more or less crimson,  $1$ - $1\frac{1}{2}$  in. across, gills adnexed, rather distant, thin, yellowish ; stem smooth, viscid when moist, shining when dry, every part deep yellow, 2-3 in. long.

Differs from *H. conicus* in the obtuse cap, and in not turning black, and from *H. ceraceus* in the bright sulphur-yellow colour.

Grassy places, especially in woods.

*H. psittacinus* (Pl. XV, fig. 8).—Cap campanulate, then expanded, more or less acutely umbonate, yellow or orange, at first covered with dark green gluten, about 1 in. across ; gills adnate, distant, thick, yellow with more or less green ; stem equal, even, often a little curved, yellow, generally green at the apex, hollow, 1-2 in. long.

Whole plant green and viscid at first, becoming yellow as the green slime disappears, except apex of stem, which remains green.

In pastures, etc.

*H. spadiceus*.—Cap campanulate, then expanded, obtuse, very glutinous, streaked with black fibrils, olive-bay, black when dry, shining, 2–4 in. across; gills broad, lemon-yellow, distant; stem striate with brownish fibrils, ground-colour yellowish, straight, hollow, about 3 in. long.

Much resembling *H. conicus*, but firmer and not becoming black or presenting a scorched appearance when growing; quite black when dry; gills thicker, more distant, and not narrowed behind.

In mossy meadows, etc.

*H. unguinosus*.—Cap campanulate, then expanded, obtuse, covered with tough, smoky brown, dripping gluten, at length cracking, about 2 in. across; gills adnate, ventricose, distant, thick, broad, connected by veins, whitish, becoming glaucous, soft; stem ventricose as a rule, more or less compressed, glutinous, hollow, coloured like the cap, about 2 in. long.

Very fragile; inodorous. Covered with a dense smoke-coloured gluten when growing.

In moist woods, etc.

*H. nitratus*.—Fragile, smell very strong, nitrous. Cap campanulate, then expanded, and usually wavy, viscid, soon dry and squamulose, dingy greyish brown,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills adnate, soon separating from the stem; broad, distant, white, then glaucous; stem thick, unequal, more or less compressed, polished, whitish or yellowish, 2–3 in. long.

Size variable. Distinguished by the obscure colour and strong nitrous smell.

In pastures.

var. *glauco-nitens*.—Rigid. Cap streaked, blackish olive or sooty, becoming pale; gills becoming glaucous; stem equal, shining.

Among grass.

#### Sub-genus II—CAMAROPHYLLUS

*H. caprinus*.—Cap conical, then expanded and umbonate, becoming depressed and rather wavy, moist, streaked, sooty brown or blackish, 3–4 in. across; gills deeply decurrent, very broad and very distant, thick, pure white, then glaucous; stem fibrillose, sooty, solid, 2–3 in. long.

The largest species in the genus, very distinct and cannot be confounded with any other.

In pine woods; rare.

*H. leporinus*.—Cap convex, gibbous, equal, broken up into floccose fibrils, reddish yellow, opaque, about 2 in. across; gills decurrent, rather narrow, yellowish red; stem more or less fusiform, fibrillose, pallid, sometimes tawny at the base, about 2 in. long.



Closely resembling *H. pratensis*, but distinguished by the cuticle of the cap being broken up into floccose tufts.

*H. bicolor*.—Cap fleshy and compact, top-shaped, convex, often becoming more or less depressed, even, smooth, pallid, and slightly tinged buff,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across ; gills rather distant, deeply decurrent, polished, clear reddish buff or pale dull orange ; stem elongated, solid, narrowed downwards, smooth, whitish,  $1\frac{1}{2}$ –2 in. long, up to  $\frac{2}{3}$  in. thick above.

With the general build, size, and appearance of *H. pratensis*, but while the latter is everywhere of one colour, pale orange-buff, this colour in *H. bicolor* is confined to the gills, the cap being much paler in colour, and the tapering stem whitish.

First noted as a British species at the Y.N.U. Fungus Foray at Egton Bridge.

Among short grass in open pastures.

On open downs, etc.

*H. nemoreus*.—Cap convex, then expanded and gibbous or depressed, almost smooth, tawny-orange,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across ; gills decurrent, thick, distant, coloured like the cap ; stem narrowed downwards or subequal, firm, whitish, minutely scaly, about 2 in. long.

Distinguished from *H. pratensis* by the pale, squamulose stem.

In pastures.

*H. pratensis* (Pl. XV, fig. 1).—Every part tawny or yellowish buff. Cap very fleshy at the disc, edge thin, convex, then expanded, almost turbinate or top-shaped, even, smooth, 1–3 in. across ; gills very decurrent, distant, broad at the middle ; stem widening upwards, polished, even, smooth,  $1\frac{1}{2}$ –2 in. long.

Cap variable, often irregular. Edible.

Among grass in pastures ; also in woods.

var. *pallidus*. Wholly ochraceous white. Cap depressed or infundibuliform, wavy.

Among grass in pastures.

var. *cinereus*.—Cap grey, thinner than the typical form ; stem pale.

In grassy places.

*H. virgineus* (Pl. XV, fig. 4).—Entirely white. Cap fleshy at the disc, edge thin, convex, soon plane, downy when dry,  $1\frac{1}{2}$ –3 in. across ; gills decurrent, rather thick, distant ; stem narrowed downwards, solid, smooth,  $1\frac{1}{2}$ –2 in. long.

Differs from *H. niveus* by its larger size and fleshy cap.

Among grass in pastures and woods.

var. *roseipes*.—Size of the typical form, white with the base of the stem more or less rosy.

In fir woods, etc.

*H. karsteni*.—Cap fleshy, disc compact, edge thin, convexo-plane,

often becoming more or less depressed, smooth, even, whitish or pure white, 2–3 in. across ; gills deeply decurrent, distant, arcuate, thick, not obviously connected by veins, yellow or citron-colour ; stem solid, narrowed downwards, rather wavy, even, almost smooth, whitish, 3–4 in. long.

Resembling *H. virgineus* in size and build, but differing in having yellow gills.

On the ground in mossy pine woods.

*H. niveus*.—Entirely white. Cap thin, without a fleshy disc, campanulate, then convex, and generally umbilicate, smooth, striate and viscid when moist,  $\frac{1}{2}$ –1 in. across ; gills decurrent, distant, thin, connected by veins ; stem equal, straight, even, smooth,  $1\frac{1}{2}$ –2 in. long.

Smaller, more slender, and tougher than *H. virgineus*. In-odorous.

Among grass, moss, etc.

*H. russo-coriaceus*.—Entirely white, fragrant. Cap persistently convex, disc very fleshy, edge thin, smooth, rather viscid,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across ; gills decurrent, thick, very distant ; stem thick at the apex, narrowed below, smooth, solid, up to 1 in. long.

About the size of *H. niveus* ; differing in the fleshy disc of the cap, and the strong smell resembling Russian leather.

In pastures, etc.

*H. ventricosus*.—Cap very fleshy at the disc, edge thin, persistently convex, sometimes irregular, white, 2–3 in. across ; gills deeply decurrent, white ; stem ventricose or thickest at the middle, solid, smooth, white, 2–3 in. long.

Known among the white species by the very fleshy cap and stout ventricose or spindle-shaped stem.

Among grass.

\*\* *Gills adnate or sinuate*.

*H. fornicatus*.—Cap campanulate, then expanded and obtusely umbonate, somewhat wavy, viscid, even, smooth, white or livid, 1–2 in. across ; gills almost free or slightly adnexed, with a decurrent tooth, thick, distant, projecting beyond the edge of the cap, white ; stem firm, tough, equal, rather wavy, smooth, shining white, 2–3 in. long.

Among grass and moss.

*H. distans*.—Cap plane or depressed, with sometimes an indication of an umbo, viscid, white, and with a silky sheen, here and there stained brown,  $1$ – $1\frac{1}{3}$  in. across ; gills adnate, broad behind, very distant, pure white ; stem rather narrowed and grey below, white above,  $1$ – $1\frac{1}{2}$  in. long.

Cap very regular. Known amongst white species by the very distant, adnate gills.

In woods.



*H. clarkii*.—Cap fragile, flesh thin, convex, then more or less plane, somewhat umbonate, smooth, even, viscid, livid-grey,  $1\frac{1}{2}$ –2 in. across ; gills broadly adnate with a decurrent tooth, broad, thick, distant, white ; stem equal, smooth, grey, base white, often bent, hollow, 2–3 in. long.

Known by the livid-grey stem and cap, and the very broad distant, adnate gills.

In woods, etc.

*H. metapodius*.—Cap convex, then plane, obtuse, at first even and somewhat shining, then silky and squamulose, irregular, greyish brown,  $1\frac{1}{2}$ –3 in. across ; gills distant, thick, veined at the sides, greyish white ; stem somewhat narrowed downwards, smooth, grey, reddish inside, 1–2 in. long.

Differs from *H. ovinus* in the thick flesh, fragility, and deformed cap, from often growing in clusters. Flesh reddish, then blackish when broken.

In mossy pastures.

*H. ovinus*.—Cap thin, campanulate, then expanded, rather umbonate, at first viscid and even, then dry and squamulose, brown or blackish, often wavy,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across ; gills adnate, with a decurrent tooth, distant, thick, grey, then tinged rufous ; stem almost equal, curved or twisted, smooth, pallid or blackish brown, about 2 in. long.

Differing from *H. metapodius*, the only one with which it can be confounded, by the rigid, fragile, very thin cap, and stem not narrowed downwards.

In mossy pastures, also in woods.

*H. subradiatus*.—Cap somewhat umbonate, radially striate, brownish, especially the disc,  $1\frac{1}{2}$ –2 in. across ; gills broadly adnate with a decurrent tooth, thin, distant, white ; stem equal, smooth, pallid, base white, hollow,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long.

Stem often twisted. Cap variable in colour, whitish, livid, or with a reddish tinge. The striate cap is a distinctive feature.

On the ground among heather, etc.

var. *lacmus*.—Cap about 1 in. across, striate when moist, even and shining when dry, lilac, then pallid.

Among moss, etc.

*H. irrigatus*.—Cap very thin, campanulate, then expanded, often becoming depressed round the umbo, edge upturned, and more or less striate when old, livid with a tinge of brown at the disc, 1– $2\frac{1}{2}$  in. across ; gills adnate, broad, thickish, rather distant, whitish ; stem rather tough, grey, very viscid, often compressed, 2–3 in. long.

*H. unguinosus* differs in the viscid cap, and *H. clarkii* differs in the stem not being viscid.

Among grass, moss, etc.

*H. clivalis*.—Cap fragile, campanulate, then expanded and gibbous, irregular, edge incurved, wavy, smooth, even, opaque, becoming polished and shining, dry, pallid, about  $1\frac{1}{2}$  in. across; gills adnexed, crowded, thick, fragile, whitish; stem solid, base narrowed, often curved, fragile, smooth, mostly white, not more than 1 in. long.

Cap somewhat gibbous, not viscid. Differs from *H. distans* in the gills being narrowed behind and nearly free.

Among grass in damp places.

### Sub-genus III—LIMACIUM

\* *Cap white or becoming yellowish.*

*H. chrysodon*.—Cap convex, then plane, obtuse, viscid, white, shining when dry, disc often tinged yellow and with minute adpressed squamules, edge with yellow fibrils, 2–3 in. across; gills decurrent, distant, broad, thin, white, edge yellowish; stem almost equal, white with minute yellow squamules crowded near the top in the form of a ring, 2–3 in. long.

Easily known by being entirely white, except the edge of the gills and edge of cap, and upper part of stem, which are more or less tinged lemon-yellow.

On the ground in woods and open glades.

*H. melizeus*.—Entirely straw-colour. Cap fleshy, convex, then expanded or slightly depressed, smooth, even, viscid, edge thin,  $\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills deeply decurrent, thin, distant, straight; stem slightly tapering downwards, soft, stuffed, apex with minute white squamules,  $2\frac{1}{2}$ –3 in. long.

Almost exactly similar in build and size to *H. eburneus*; differing in being entirely straw-colour both outside and inside, and in having a pleasant, spicy smell. Edge of the cap at first inturned and downy, soon expanding and becoming naked.

This species is probably passed over at times as a somewhat slender, pale specimen of *H. pratensis*.

Among grass in woods.

*H. eburneus*.—Cap convex, then almost plane, even, viscid, edge at first incurved and downy, soon naked, 1–2 in. across; gills decurrent, distant, firm, straight; stem narrowed downwards, viscid, rough at the apex with wart-like squamules,  $1\frac{1}{2}$ –3 in. long.

Resembling *H. cossus* in general appearance, but the colour is a purer white, and the strong smell of *H. cossus* is absent.

In woods. Gregarious.

*H. cossus*.—Cap convex, then plane, obtuse, glabrous, glutinous, white with a yellow tinge, disc somewhat ochraceous, shining when dry, 1–2 in. across; gills adnato-decurrent, distant, connected by veins, firm, white; stem equal, white, rough with points above,



often with a yellow tinge, 2–3 in. long. Smell very strong, resembling that of the larva of the goat-moth.

Differs from *H. eburneum* in the yellowish cap and strong smell. Among grass in woods.

*H. pulverulentus*.—Cap convex, sometimes becoming slightly depressed, viscid, white, edge slightly incurved, downy, about  $\frac{1}{2}$  in. across; gills decurrent, thick, edge rather thick, whitish; stem slightly curved, white and powdered with rosy meal, about  $\frac{2}{3}$  in. long.

Known by its small size and rose-powdered stem.

Among pine leaves, etc.

*H. penarius*.—Cap fleshy, especially when young, at first umbonate, then very obtuse and expanded, smooth, opaque tan-colour, 2–3 in. across; gills very slightly decurrent, distant, thick, veined, pallid tan; stem ventricose or narrowed below, and ending in a long fusiform root, pallid white, glutinous, the gluten soon drying and forming a rough surface,  $1\frac{1}{2}$ –2 in. long.

In mixed woods.

\*\* *Cap reddish*.

*H. erubescens*.—Cap fleshy, gibbous, then convexo-plane, adpressedly squamulose, then almost smooth, fundamental colour white, but becoming reddish all over, often rose or blood-red, 2–5 in. across; the white flesh also becomes red; gills decurrent, distant, white, variegated with red spots; stem stout, wavy, with red fibrils and points at the apex, 2–4 in. long.

Under pines, etc., often forming large fairy rings.

*H. pudorinus*.—Cap fleshy, convex, then expanded, smooth, viscid, vermilion or flesh-colour on a yellow ground, 2–4 in. across; gills adnate, then decurrent, distant, white, not spotted; stem smooth, whitish, constricted at the apex, rough with white points, solid, 2–3 in. long.

Colour approaching that of *H. erubescens*, but clearer. Cap sometimes spotted yellow, or this colour may be entirely absent.

In fir woods.

*H. glutinifer*.—Cap convex, then expanded, broadly gibbous, or sometimes depressed, disc wrinkled, rufescent, whitish towards the edge, with a thick coating of gluten, 2–4 in. across; gills slightly decurrent, rather thick, white; stem slightly swollen below the middle, rather elastic, coloured like the cap, or paler upwards, and with white squamules, 3–4 in. long.

Known by the ventricose stem and wrinkled disc of the cap. In woods.

\*\*\* *Cap tawny or yellow*.

*H. arbustinus*.—Cap convex, then almost plane, viscid, streaked with fine raised lines, pale tawny, 1–2 in. across; gills adnate,

rather distant, firm, white ; stem equal, elastic, pallid, the apex with free powdery granules,  $1\frac{1}{2}$ –3 in. long.

Differs from all allied forms in the loose white granules at the apex of the stem.

In woods under birch, etc.

*H. aureus*.—Cap very fleshy at the disc, edge thin, convex, then almost plane, glutinous, clear, shining golden yellow, about 1 in. across ; gills slightly decurrent, distant, thin, whitish ; stem about equal, smooth, whitish upwards, reddish tawny and with an imperfect ring formed from the glutinous veil, about 2 in. long.

Differs from all other golden yellow species in having the cap and stem glutinous.

In woods.

*H. discoideus*.—Cap campanulato-convex, then plane and somewhat obtuse, at length with the disc depressed, even, very smooth, very glutinous, yellowish red, then paler, disc always darker and rusty, 1–2 in. across ; gills at first adnate and crowded, then decurrent and distant, thin, soft, yellowish white ; stem equal or narrowed upwards, very soft, fibrous, flocculose, viscid, pallid white, apex spotted with white,  $1\frac{1}{2}$ –2 in. long.

Among grass in pine woods, etc.

*H. aromaticus*.—Cap convex, then expanded and almost plane, very fragile, cinnamon-colour, smooth ; glutinous, the gluten in drying contracts and forms irregularly anastomosing ribs, 2–3 in. across ; gills slightly decurrent, white with a pink tinge ; stem almost equal, coloured like the cap,  $1\frac{1}{2}$ –2 in. long.

Smell spicy ; taste acrid.

Among grass.

\*\*\*\* *Cap olivaceous umber*.

*H. limacinus*.—Cap convex, then expanded, obtuse, smooth, viscid, disc umber, then smoke-colour, becoming paler towards the edge,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across ; gills adnate, then decurrent, rather distant, thin, greyish white ; stem thick, ventricose, flocculose, fibrillose striate, apex rough with squamules, 2–3 in. long.

Intermediate between *H. agathosmus* and *H. olivaceoalbus* ; differing from the former in the presence of an evident veil, and from the latter in the squamulose apex of the stem.

In woods.

*H. olivaceoalbus*.—Cap fleshy at the disc, very thin elsewhere, obtusely cylindrical, then expanded, umbonate, even, covered with olive gluten that disappears, leaving the cap paler, umbo brownish, 1–2 in. across ; gills slightly decurrent, rather distant, shining white ; stem equal, often slightly curved, viscid, whitish, but spotted and stained with brown from the veil, apex smooth, 2–3 in. long.

Woods and woodland pastures.



*H. latitabundus*.—Cap fleshy, convex, then expanded, smooth, sooty, becoming yellowish with an olive tinge, 3–4 in. across; gills subdecurrent, distant, white; stem solid, firm, thick, viscid, rather scaly above, 3–5 in. long.

Probably often confounded with *H. limacinus*.

In woods.

W. G. Smith considers this species to be identical with *H. clarkii*. I consider the two as distinct.

*H. hypothejus*.—Cap convex, then depressed, sometimes almost infundibuliform, even, slightly wrinkled with streaks, greyish olive, at first covered with olive mucus, paler and yellowish olive or brownish after the mucus has disappeared, flesh thin, tinged yellow, 1–2½ in. across; gills decurrent, distant, white, then with a yellow or yellowish pink tinge; stem almost equal, viscid, paler than the cap, veil at first evident in the form of an imperfect ring, soon disappearing, 2–4 in. long.

Known by the yellowish olive colour, and the glutinous cap and stem. *H. olivaceoalbus* differs in the persistently shining white gills.

*H. cerasinus*.—Smell strong, resembling crushed cherry-laurel. Cap very thick at the disc, convex, broadly and obtusely umbonate, even, viscid, pale umber, then greyish, edge downy, about 1½ in. across; gills slightly decurrent, very distant, white with a pink tinge; stem generally slightly ventricose below the middle, base rather abruptly narrowed, white, with minute, wart-like squamules near the apex, 2–3 in. long.

Its principal distinguishing features are the strong smell and abruptly narrowed base of the stem.

In fir plantations, etc.

\*\*\*\*\* *Cap dingy grey or livid.*

*H. fuscoalbus*.—Cap convex, then plane, even, smooth, viscid, brownish, then grey, the edge paler, about 2 in. across; gills slightly decurrent, rather thick, snow-white; stem equal, dry, whitish, with white flocculent tufts at the apex, 2–3 in. long.

In woods.

*H. agathosmus*.—Cap fleshy, convex, then plane, gibbous, viscid, livid-grey everywhere, covered with minute, viscid, pellucid, whitish points, edge at first incurved and downy, soon spreading, wavy and smooth, 1½–3 in. across; gills decurrent, distant, soft, white; stem solid, firm, becoming very soft and often hollow, fibrillose striate, not viscid, with white spot-like squamules above, becoming greyish, rough, almost mealy, 2–3 in. long.

Smell, especially when old, resembling aniseed.

In pine woods, etc.

*H. mesotephrus*.—Cap rather fleshy at the disc, somewhat hemispherical, white with a brown disc, viscid, striate, 1–1½ in. across; gills decurrent, pure white, rather distant; stem slender, wavy,

*C. ditopa*.—Smell very strong, resembling meal. Cap thin, convex, then plane, at length depressed, dingy brownish grey, even, smooth, hygrophalous, 1–1½ in. across; gills slightly decurrent, crowded, thin, dark brownish grey; stem equal, almost smooth, hollow, coloured like the cap, about 1 in. long.

Resembling *C. metachroa* in general appearance, but distinguished by the strong smell of meal. Cap brownish grey, convex when small, the larger forms depressed and wavy.

On the ground in woods, especially of pine.

*C. pausiaca*.—Cap thin, convex, then plane, even, smooth, umber with an olive tinge, ochraceous when dry, about 1 in. across; gills obtusely adnate, ventricose, crowded, olivaceous umber; stem equal, striate, coloured like the cap, apex powdered with white meal, hollow, 2–3 in. long.

Near to *C. ditopa*, agreeing in the mealy smell, differing in the olive or umber gills.

In pine woods.

\*\* *Gills whitish*.

*C. diatrata*.—Cap thin, tough, convex when young, edge inturned, downy, flattened or depressed when adult, often wavy, even, smooth, dingy flesh-tint when moist, at length tan-colour and flaccid, edge spreading and whitish when dry, 1–2 in. across; gills adnate, but narrowed and with a decurrent tooth behind, crowded, narrow, whitish flesh-tint at first, then pallid whitish; stem equal, round, even, smooth, pallid, apex naked, base downy, elastic, rather wavy, 1½–2 in. long.

Differs from *C. fragrans* by the total absence of a spicy odour. Stem not cartilaginous.

In pine woods, etc.

*C. fragrans*.—Smell strong, spicy. Cap rather thick, convex, soon expanded and slightly depressed or umbilicate, even, smooth, hygrophalous, uniform watery white, disc not darker, whitish when dry, about 1 in. across; gills slightly decurrent, rather crowded, narrow, distinct, whitish; stem equal, slightly curved as a rule, elastic, smooth, whitish, about 2 in. long.

Known from other whitish species about its size by the strong smell, resembling aniseed.

Among grass, moss, etc.; roadsides and woods.

*C. angustissima*.—Cap even, smooth, watery white, shining white when dry, plane, then depressed, not umbilicate, edge spreading, minutely striate when adult, about 2 in. across; gills rather decurrent, very much crowded, thin, narrow, white; stem often curved or wavy, white, base downy, apex naked, about 2 in. long.

Closely resembling *C. inodora*, but entirely devoid of smell, and



the cap a clearer white. The same characters and the densely crowded gills separate it from *C. obsoleta*.

In woods, roadsides, etc.

*C. obsoleta*.—Cap rather fleshy, convex, then plane or slightly depressed, sometimes papillate, even, smooth, hygrophane, pallid or pale pinky tan, whitish when dry, about 1 in. across; gills obtuse behind, adnately decurrent, sometimes almost rounded behind, broad, crowded, whitish; stem whitish, elastic, hollow, about 1 in. long.

Intermediate between *C. fragrans* and *C. metachroa*. Smell pleasant, like aniseed, but not strong. Differing from *C. fragrans* in the subadnate gills and mealy apex of the stem.

Among grass or leaves.

#### F.—VERSIFORMES

\* *Cap dingy or brownish*.

*C. ectypa*.—Cap rather thin, then almost plane, centre often slightly depressed, edge sometimes arched, striate, dingy or horny yellow, becoming rufescent and squamulose or virgate with sooty fibrils, 2–3 in. across; gills adnate, with a decurrent tooth, distant, connected by veins, white, soon pallid, then spotted with rufous, mealy with the white spores; stem somewhat bulbous or equal, fibrillose, dingy yellowish, soon olive and the base becoming blackish, 2–4 in. long.

Gregarious; sometimes several stems are joined at the base, resembling *Armillaria mellea* in colour and general appearance, but without a trace of a ring. Smell pleasant, at first resembling aniseed, at length foetid. Cap brown when decaying.

In swampy places, etc. Rare.

*C. sadleri*.—The fungus described as a *Clitocybe* under this name proves to be only a sterile condition of a species of *Hypholoma*, in which, owing to the arrest in the formation of spores, the gills remain permanently white.

#### LACCARIA

Cap regular, convex, then umbilicate or depressed, thin; gills broadly adnate, sometimes with a decurrent tooth, becoming mealy with the globose, warted spores; stem central, fibrous outside.

Recognized by the broadly adnate gills becoming densely powdered with the white spores. The species included in the present genus were at one time included in *Clitocybe*, from which they are solely distinguished by the globose, warted spores, which persist on the surface of the gills, and forming a distinct white bloom.

The species grow on the ground, are brightly coloured, and mostly very common.

*L. laccata*.—Cap thin, convex, then often more or less wavy or irregular, umbilicate, even, hygrophane, rich brown or orange-brown, almost white and minutely squamulose or velvety when dry, 1–2½ in. across; gills adnate, distant, coloured like the cap, at length powdered with the white spores; stem equal, fibrous, coloured like the stem, tough, stuffed, 2–3 in. long (spores colourless, globose, warty, 8–9  $\mu$  diameter).

Very variable in form and colour, being rich orange-brown when moist, and pale buff or almost white when dry, the cap becoming densely squamulose.

On the ground in woods, etc. Very common.

var. *amethystina*.—Structure and size identical with the typical form, but deep amethyst or violet when moist, becoming pale lilac or almost white, and densely squamulose when dry (spores same as in the typical form).

*L. bella*.—Cap rather fleshy, convex, then depressed or umbilicate, orange-yellow, with small, scattered, darker adpressed squamules, 1–1½ in. across; gills adnate, with a decurrent tooth, broad, rather distant, yellow, connected by veins, at length powdered with white meal; stem equal, tough, rivulose, yellowish, stuffed, about 2 in. long. Smell foetid.

Distinguished from *L. laccata* by its very foetid smell, which resembles that of *Clitocybe ectypa*.

On rotten fir wood. Somewhat clustered.

#### OMPHALIA

Cap symmetrical, usually thin, depressed or infundibuliform; gills decurrent; stem central, distinctly cartilaginous or polished outside, usually expanding upwards into the flesh of the cap; spores white.

Agreeing with *Clitocybe* in having a symmetrical cap and decurrent gills, but readily distinguished by the smooth, polished stem, which in *Clitocybe* is fibrous. Separated from *Collybia* and *Mycena* by the decurrent gills.

The species are mostly small, growing on wood, twigs, etc.; some grow on the ground.

##### A.—COLLYBIARII

*Cap expanded from the first, edge incurved.*

##### B.—MYCENARII

*Cap campanulate at first, edge of the cap straight and pressed to the stem when young.*

##### A.—COLLYBIARII

\* Usually large, gills narrow, much crowded.

*O. hydrogramma* (Pl. XI, fig. 12).—Cap thin, flaccid, deeply umbilicate. Very hygrophane, edge spreading and rather wavy,



striate, livid white, whitish when dry, 2–3 in. across ; gills very decurrent, closely crowded, narrow, very unequal, livid white ; stem hollow, smooth, base rooting, livid, about 3 in. long.

Somewhat tufted ; becoming altogether whitish when dry, and then somewhat resembling *Clitocybe phyllophila*, which may be distinguished by the fibrous stem, plano-depressed cap and very slightly decurrent gills.

Among damp, rotting heaps of leaves, etc.

*O. detrusa*.—Cap rather fleshy, convex, then more or less depressed and umbilicate, even, smooth, indistinctly zoned, dark grey, about  $1\frac{1}{2}$  in. across ; gills slightly decurrent, thin, crowded, whitish ; stem smooth, soon hollow, dark grey, about  $1\frac{1}{2}$  in. long.

Resembling in habit certain species of *Clitocybe*, but distinguished by the cartilaginous stem.

*O. maura* (Pl. XI, fig. 7).—Cap thin, convex, deeply umbilicate, smooth, hygrophanous, striate when moist, sooty brown, even, livid, and shining with a silky sheen when dry,  $1-1\frac{1}{2}$  in. across ; gills very deeply decurrent, narrowed at both ends, very closely crowded, shining white ; stem almost horny, fragile, sooty black, 1–2 in. long.

The umbilicus of the cap is very deep, the remainder arched with the edge drooping. Superficially resembling *Collybia atrata*, but distinguished by the decurrent, narrow, crowded gills.

*O. offuciata*.—Cap thin, convex, then plano-depressed, but not deeply umbilicate, smooth, even, hygrophanous, dark, then pale flesh-colour, becoming pale or almost white when dry or old, about 1 in. across ; gills decurrent, crowded, narrow, coloured like the cap ; stem equal, round, then flattened, smooth, reddish, apex slightly mealy, hollow, about 2 in. long.

The larger forms resemble *Collybia dryophila* in habit, the smaller forms resemble *Tricholoma carneolum*, but quite distinct from both in the decurrent gills.

In woods, especially beech, among fallen leaves.

\*\* *Plants of medium size ; gills slightly decurrent, narrow, narrowed at both ends.*

*O. chrysophylla*.—Cap thin, pliant, deeply umbilicate, very hygrophanous, flocculose or squamulose, brownish yellow when moist, tan-colour or whitish, and hoary when dry,  $1-2\frac{1}{2}$  in. across ; gills decurrent, distant, broad, unchangeable deep golden yellow ; stem tough, soon hollow, usually slightly curved, golden egg-yellow, base downy, somewhat rooting, 1–2 in. long.

Differs from *O. postii* in the flocculose yellow-brown cap, broader gills, and in growing on wood.

On rotten pine wood, pine sawdust, etc.

*O. postii* (Pl. XI, fig. 10).—Cap thin, deeply umbilicate, smooth, edge striate, orange, about 1 in. across; gills deeply decurrent, narrow, rather distant, whitish; stem even, smooth, yellow, hollow, straight, 2–3 in. long.

The bright orange-colour of the smooth cap distinguishes this from every other species.

In swamps.

var. *aurea*.—Cap infundibuliform, bright golden yellow; gills slightly decurrent, white; stem coloured like the cap.

On *Sphagnum* in swamps.

*O. pyxidata*.—Cap thin, umbilicate, then infundibuliform, almost smooth, striate, brick-red, or with a rufescent tinge when wet, hygrophanous, whitish and minutely silky when dry,  $\frac{1}{2}$ –1 in. across; gills decurrent, rather distant, narrow, flesh-colour, then yellowish; stem even, tough, rufescent, soon hollow, about 1 in. long.

Among short grass, etc.

*O. leucophylla*.—Cap thin, infundibuliform, almost smooth, not at all floccose, edge involute, dark grey, 1–2 in. across; gills decurrent, rather distant, shining white; stem equal, smooth, grey, stuffed, then hollow,  $1\frac{1}{2}$ –2 in. long.

Distinguished from every other species by the persistently white, shining gills.

Damp places in woods, etc.

*O. luffii*.—Cap convex, then wavy, depressed, old ivory-colour, even, smooth, about 1 in. across; gills crowded, decurrent, pale wood-colour; stem about 1 in. long, often crooked, solid, polished, colour of gills.

Smell spicy, like *Clitocybe fragrans*, from which it differs in the short, polished stem.

On the ground.

*O. striæpileus*.—Cap thin, convex, then expanded, umbilicate, smooth, everywhere striate, livid brown, hygrophanous,  $\frac{2}{3}$ – $1\frac{1}{4}$  in. across; gills slightly decurrent, not crowded, whitish; stem smooth, tough, tinged with brown, hollow, about 2 in. long.

Distinguished by the cap being entirely striate from the disc to the edge.

Among grass in woods, etc.

*O. telmatiaea* (Pl. XI, fig. 11).—Cap thin, pliant, depressed and soon infundibuliform, edge broadly arched and drooping, dark umber-brown, hygrophanous, pale buff and silky when dry, 1–3 in. across; gills decurrent, rather crowded, thin, pallid; stem polished, grey, equal, white and cottony at the base, 1–2 in. long.

Readily known by the dark umber cap when moist, and the bluish grey stem. The cap is often more or less elegantly waved at the drooping edge. The stem is attached to the moss on which it grows by white, cottony mycelium.



Attached to *Sphagnum* or other mosses in partly dried-up swamps. Rare.

*O. nevilleæ*.—Cap hemispherical, depressed in the centre, wrinkled and minutely granulated at the disc, striate, brown, pale towards the margin when dry, about  $\frac{1}{2}$  in. across ; gills arcuately decurrent, sides veined and wrinkled, white ; stem brownish, rough with black granules, rather swollen at the base and clothed with white downy hairs, about 1 in. long.

On *Sphagnum* in a plant pot. Possibly an introduced species.

*O. sphagnicola*.—Cap very thin, umbilicate, then deeply infundibuliform, slightly striate and minutely squamulose, dingy ochraceous, about 1 in. across ; gills decurrent, rather narrow, distant, pale, dingy ochraceous ; stem slightly wavy, smooth, coloured like the cap, 1–2 in. long.

Whole plant tough and elastic. Gills thick.

On *Sphagnum* in swamps, etc.

*O. philonitis*.—Cap thin, entirely deeply umbilicate, edge erect and straight, not striate, hygrophanous, smoky grey, floccose when dry,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across ; gills deeply decurrent, rather distant, narrow, lanceolate, grey ; stem slender, equal or narrowed upwards, smooth, grey, base downy,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long.

Differs from *O. oniscus* and *O. epichysium* in the longer stem, the deeply infundibuliform cap with the edge erect, and in appearing in the spring.

In swamps on *Sphagnum*, also on rotten wood. Appearing in spring.

*O. oniscus*.—Cap thin, flaccid, fragile when old, convex, with an umbilicus, or infundibuliform, often irregular, wavy or undulated, smooth, dark grey, paler and hoary grey when dry, even, up to 1 in. across ; gills decurrent, rather distant, grey, darker when dry ; stem stuffed, then hollow, rather firm but tough, often curved and compressed, surface undulated, grey, about 1 in. long.

Distinguished by the grey colour of every part. Allied to *O. pyxidata*, which differs in the yellow-brown colour. *O. rustica* differs in the shorter stem, and *O. striæpileus* in the longer, slender stem.

Among damp mosses, etc.

*O. cæspitosa*.—Cap thin, almost hemispherical, umbilicate, sulcate almost to the centre, edge crenate, smooth, pale ochraceous white, about  $\frac{3}{4}$  in. across ; gills shortly decurrent, distant, rather broad, whitish ; stem almost equal, slightly bulbous at the base, hollow, coloured like the cap,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long.

The colour is generally a delicate ochraceous white. On banks, etc.

*O. glaucophylla*.—Cap thin, infundibuliform, with fold-like striations, almost smooth, mouse-colour, hygrophanous, up to  $\frac{1}{2}$  in. across; gills decurrent, rather distant, lanceolate, olive; stem stuffed, firm.

Becoming pale and almost even when dry. An imperfectly known species, apparently distinct.

On the ground in woods.

*O. rustica*.—Cap thin, slightly convex, umbilicate, smooth, striate, hygrophanous, nearly even and slightly silky when dry, greyish brown, 3–6 lines across; gills decurrent, rather thick, narrowed towards each end, grey; stem slender, equal or slightly thickened upwards, polished, grey or brown, up to 1 in. long.

Somewhat resembling *O. umbellifera*, but known by the gills being narrowed behind.

Cap deeply umbilicate, edge deeply arched, in some forms smooth and becoming brownish, in others silky and hoary; gills always broadest in the middle.

On the ground.

\*\*\* *Gills very distant, broad, usually thick.*

*O. hepatica*.—Cap very thin, tough, rigid, convex and umbilicate, then infundibuliform, even, smooth, rufous flesh-colour, yellowish tan and somewhat shining when dry,  $\frac{1}{2}$ –1 in. across; gills decurrent, distant, rather narrow, forked, rather thick, pallid; stem slender, very tough, often compressed, brownish flesh-colour, hollow, up to 1 in. long.

Very tough and flexible; cap sometimes waved and lobed; gills distinctly connected by veins. Very much resembling *O. pyxidata*, differing in being coriaceous, edge of cap even, and absence of the reddish tinge of the gills.

On lawns, by roadsides, etc.

*O. demissa*.—Cap at first convex, soon expanded and umbilicate, rather fleshy, edge crenulate, reddish grey or buff, at length pale and minutely mealy, about  $\frac{1}{2}$  in. across; gills decurrent, rather thick, flesh-coloured, especially towards the edge, forked, rather distant, slightly connected by veins, stem slender, wavy, coloured like the cap, smooth, shining, solid, about  $\frac{1}{2}$  in. long.

On the ground among grass, moss, etc., in exposed places.

*O. muralis*.—Cap thin, pliant, umbilicate, edge arched and striate and crenulate, smooth, reddish brown,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across; gills decurrent, narrowed at both ends, distant, pallid, or white with a yellow tinge; stem slender, smooth, stuffed, coloured like the cap,  $\frac{1}{2}$ – $\frac{2}{3}$  in. long.

Intermediate between *O. hepatica* and *O. umbellifera*, differing from the former in the striate cap when moist, and by the gills not being connected by veins; from the latter by the gills being



narrowed behind. Known from *O. rustica* in the absence of a grey tinge on the cap and stem.

On walls, sandy banks, etc.

*O. umbellifera*.—Cap rather fleshy, convex, then almost plane, often more or less wavy or the edge upturned, striate when moist, often minutely umbilicate, colour variable, most frequently whitish, but grey, yellow, brownish or green, even and somewhat silky when dry, about  $\frac{2}{3}$  in. across ; gills decurrent, very distant, broad behind, coloured like the cap ; stem coloured like the cap, base downy, about  $\frac{1}{2}$  in. long.

Known from allied species by the thicker, almost flat cap, and the broad, almost triangular, very distant gills.

In swamps, exposed pastures, etc. On the ground.

var. *abiegnus*.—Entire plant pale yellow.

Gregarious, on decayed fir stumps.

var. *viridis*.—Every part pale green.

On dead wood.

var. *myochrous*.—Cap rather fleshy, smooth, brownish umber ; stem hairy and rooting at the base ; gills somewhat branched.

On sodden beech trunks.

*O. infumata*.—Cap obtuse, not membranaceous, greenish, then smoky ; gills few, broad, decurrent, distant, yellow ; stem thin, yellow.

Cap 2 lines across ; stem 1 in. long, slender, dilated at the base, downy below ; gills about twelve, with smaller intermediate ones. Allied to *O. umbellifera*, but quite distinct from all its varieties.

*O. buccinalis*.—Wholly white. Cap about  $\frac{1}{4}$  in. across, trumpet-shaped, soon plane or depressed ; gills deeply decurrent, triangular, distant, white ; stem quite short.

On twigs, etc.

*O. retosta*.—Cap thin, plane, then depressed, even, umber, margin arched, polished and smooth when dry,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across ; flesh pale umber ; gills slightly decurrent, equally narrowed at each end, distant, pale umber ; stem slender, equal, smooth, tough, hollow, paler than the cap, up to 1 in. long.

Somewhat resembling the umber form of *O. umbellifera*, but firmer, and the gills differ in being narrowed at each end. Like *O. umbratilis* in colour and form, but readily known by the distant gills.

*O. abhorrens*.—Very foetid. Cap umbilicate, smooth, brown, becoming pale ; gills narrow, decurrent, pale ; stem slender, slightly thickened at the apex, coloured like the cap, about 1 in. long.

Closely allied to *O. retosta*, differing in its disgusting smell. Stem sometimes pruinose when young.

Among short grass on lawns, etc.

*O. pseudoandrosacea*.—Cap very thin, convex or expanded, umbilicate, and at length infundibuliform, striately plicate, edge crenulate, smooth, whitish or greyish, about  $\frac{1}{2}$  in. across; gills deeply decurrent, distant, rather triangular, whitish; stem slender, equal, whitish or greyish, about 1 in. long.

Allied to *O. griseopallida*, but much more slender; differs from *O. grisea* in the infundibuliform or umbilicate cap.

Among short grass.

*O. griseopallida*.—Cap thin, convex, then plane, umbilicate, even, smooth, hygrophanous, somewhat shining, brownish grey, becoming hoary, often unequal or excentric, edge drooping but not incurved, up to  $\frac{1}{2}$  in. across; gills decurrent, broadest behind, rather thick, colour of the cap when moist, darker when dry; stem equal or slightly thickened upwards, smooth, brown, up to  $\frac{1}{2}$  in. long.

Somewhat resembling *O. umbellifera* and *O. rustica*, differing from both in the cap not being striate when moist.

On naked ground.

*O. bibula*.—Cap soon expanded and plane or more or less umbilicate, edge remaining for some time incurved, smooth, even,  $\frac{1}{4}$ – $\frac{3}{4}$  in. across; the entire plant is a clear yellowish green when moist, the stem and gills perhaps being a little clearer yellow than the cap, which becomes tinged with grey when dry; gills shortly decurrent, slightly arcuate and somewhat distant; stem 1–1 $\frac{1}{2}$  in. long, slender, slightly thickened downwards and surrounded by white strigose down at the base, fistulose; spores hyaline, smooth, elliptical, 5–6+4  $\mu$ .

First found in this country in Mulgrave Woods, at the Y.N.U. Foray, September, 1910. Differs from *Hygrophorus wynnii* in its habitat.

On fallen fir bark among moss.

*O. stellata*.—White. Cap very thin, convex, umbilicate, pellucidly striate, smooth, up to  $\frac{1}{2}$  in. across; gills decurrent, rather distant, thin, not triangular; stem very slender, fragile, often curved, base dilated and radiately strigose or hairy, usually less than 1 in. long.

Allied to *O. integrella*, but distinguished by the broader gills. Differs from *O. umbellifera* by being more slender, usually excentric cap, and general form.

On rotten trunks, wood, etc.

## B. MYCENARI

*O. campanella*.—Cap thin, campanulately convex, sometimes becoming expanded, umbilicate, striate, hygrophanous, rusty yellow, about  $\frac{1}{2}$  in. across; gills decurrent, rather crowded, connected by veins, yellowish; stem horny, smooth, tapering, bay, and with tawny down at the base, about 1 $\frac{1}{2}$  in. long.



In fir woods, often on fir trunks.

var. *badipus*.—Stem stuffed, somewhat fibrillose, and with tawny down at the slightly bulbous base ; cap 3–11 lin. across.

On the ground ; gregarious.

var. *papillata*.—Cap acutely conical, becoming depressed round the umbo.

On the ground in pine woods, etc.

var. *myriadea*.—Usually about half the size of the typical form, densely tufted, pale tawny ; gills pale brick-red, with a flesh tinge.

Covering pine trunks.

*O. picta*.—Cap thin, cylindric-campanulate, brown, disc umbilicate, usually yellow, the perpendicular sides striate, edge paler, entire, 3–5 lines across ; gills adnate, appearing to be subdecurrent from the shape of the cap, very broad, distant, whitish, then tinged yellow ; stem very slender, horny, rigid, straight, smooth, bay, base discoid, apex paler, 2–3 in. long.

On fallen twigs and branches.

*O. camptophylla*.—Cap very thin, convex, then expanded, deeply striate, disc brown, pale and greyish towards the edge, about  $\frac{1}{2}$  in. across ; gills white, ascending for some distance from the front, then abruptly decurrent ; stem very slender, equal, minutely downy, whitish, with a radiating base, about 2 in. long.

On sticks, etc.

*O. grisea*.—Cap very thin, campanulate, then convex, slightly papillate and at length slightly umbilicate, not becoming fully expanded, smooth, striate, hygrophanous, livid grey, then hoary, about  $\frac{1}{2}$  in. across ; gills shortly decurrent, distant, broad, rather thick, greyish white ; stem straight, even, smooth, greyish white, up to 3 in. long.

Recalling to mind *Cantharellus devexus*, but differing in the more numerous, broader gills. Intermediate in structure between the genera *Mycena* and *Omphalia*.

Among grass in woods, etc.

*O. umbratilis*.—Cap very thin, obtusely bell-shaped or campanulate, then convex and umbilicate, smooth, blackish brown, edge slightly striate, about 1 in. across ; gills very slightly decurrent, arcuate, narrowed at both ends, white with a brownish tinge ; stem slender, even, smooth, blackish brown, tough, 1–3 in. long.

Tough, hygrophanous, hoary when dry. Somewhat resembling *O. retosta*, but distinguished by the crowded gills. Readily confounded with *Collybia atrata* and *C. arbusta*.

Sides of ditches and damp places.

*O. fibula*.—Cap very thin, margin drooping, then spreading at the extreme edge, sometimes truly conical and papillate, usually umbilicate and at length infundibuliform, hygrophanous, smooth, striate when moist, orange-yellow, sometimes brownish, or entirely

white, up to  $\frac{1}{2}$  in. across ; gills deeply decurrent, distant, broad, whitish ; stem very slender, coloured like the cap, 1–1 $\frac{1}{2}$  in. long.

A very beautiful little fungus, usually slender and weak, sometimes more robust.

Damp places among moss, etc. Often abundant on ground that has been burnt.

var. *swartzii*.—About the size of the typical form, but differing in the almost plane, whitish cap with a brown disc ; stem whitish, apex tinged violet.

On the ground.

*O. directa*.—Very minute, resembling a miniature nail or drumstick. Cap rarely 1 line across, apex flat, white ; gills decurrent, white ; stem rather wavy, not 1 in. long, very slender, whitish with a rufous tinge, with long hairs at the base.

On dead leaves. Gregarious.

*O. belliae*.—Cap very thin, dry, top-shaped, infundibuliform, mouth partly closed by the incurved edge, pale wood-colour, about  $\frac{1}{2}$  in. high ; gills decurrent, thick, interstices veined, paler than the cap ; stem brownish below, paler above, about 1 $\frac{1}{2}$  in. long.

Cap trumpet or funnel-shaped, with the edge incurved.

On dead stems of reeds. Clustered.

*O. gracillima*.—Snow-white, cap very thin, somewhat downy or floccose, grooved, 1–3 lines across ; gills rather distant, thin, decurrent ; stem very slender, base cottony, about  $\frac{1}{2}$  in. high.

A very minute, delicate species, soon drying up. Stem as thin as a hair, soft. Agreeing in many points with *O. stellata*, but more delicate, cap at first flocculose, shape, and thin gills separate it.

On decaying herbaceous stems in damp places.

*O. bullula*.—White. Cap very thin, even, hemispherical, diaphanous, even, 1–2 lines across ; gills arched, decurrent ; stem very slender, not 1 inch long.

Somewhat resembling *O. integrella* ; known by the even, almost pellucid cap and broader gills.

On dead sticks. Scattered.

*O. integrella*.—White. Cap thin, conical, soon hemispherical, often deformed, expanded, disc depressed, then  $\frac{1}{2}$  in. or more across, edge striate ; gills decurrent, narrow, fold-like, distant, edge acute ; stem firm, downy below, base often attached by a minute downy bulb, up to 1 in. long.

On rotten leaves, grass, and on damp ground in shady places. Commonly fasciculate, especially when growing on wood, when the stem is incurved ; fragile, variable in form.



## PLEUROTUS

Cap excentric, sometimes resupinate, fleshy or very thin; gills decurrent or sometimes adnate, edge sharp and thin; stem gradually expanding into the flesh of the cap, excentric, lateral or absent.

The principal feature of the present genus is the excentric or lateral stem. The species grow on wood, twigs, moss, etc., rarely on the ground. Some are edible.

## ANALYSIS OF THE SPECIES

## A.—EXCENTRICI

Cap entire, extended laterally, stem excentric but not truly lateral.

## B.—DIMIDIATI

Stem distinctly lateral, not marginate behind; not resupinate at first.

## C.—RESUPINATI

Cap at first resupinate, then reflexed or turned over, sessile; gills radiating from an excentric point.

## A.—EXCENTRICI

\* *Veil forming a ring on the stem.*

*P. corticatus*.—Cap convex, then expanded and almost plane, horizontal, entire, everywhere covered with a dense greyish down when young, which becomes broken up into squamules on a whitish ground, edge strongly inturned when young, 4–8 in. across; gills strongly decurrent, forked, anastomosing behind, white, then tinged yellow; stem solid, hard, rooting, curved, squamulose, white, ring cottony, thick, torn into shreds, 1–3 in. long.

Often large and showy. The presence of a ring and the deeply decurrent gills anastomosing behind are the points of the present species.

On trunks.

*P. dryinus*.—Cap oblique or somewhat circular, compact and hard, whitish, variegated with innate brownish scales, edge incurved and bearing fragments of the torn veil, 2–4 in. across; gills decurrent, very narrow, almost simple, not anastomosing, white, tinged primrose; stem very excentric, but not truly lateral, rarely almost central, stout, about 1 in. long.

The entire fungus becomes yellowish when dry or bruised.

On trunks of oak, hornbeam, etc.

*P. spongiosus*.—Cap excentric, somewhat lateral, pulvinate, covered with persistent grey down, 2–3 in. across; gills sinuately adnexed, with a decurrent tooth, simple, distinct, crowded, white, edge entire; stem up to 1 in. long, sometimes wanting, excentric,

curved, not rooting, downy, white, ring white, soon torn, adhering for some time to the edge of the cap.

On trunks of beech, etc.

\*\* *Veil and ring absent ; gills sinuate or adnate.*

*P. ulmarius*.—Cap fleshy, compact, horizontal, fairly regular, but more or less excentric, convex, then plane and disciform, even, smooth, livid, becoming pale but marbled with roundish spots, 3–7 in. across ; gills emarginate and rounded behind, slightly adnexed, broad, rather crowded, whitish ; stem solid, elastic, somewhat excentric, curved, stout, downy, white, 2–3 in. long.

Often very large. When the fungus grows from the side of a trunk the stem is more or less excentric and ascending ; when growing on a horizontal surface the stem is often central and erect, when it resembles a *Tricholoma*, but distinguished by growing on wood.

*P. decorus*.—Cap fleshy, brittle, convex, then expanded or depressed, often excentric, yellow, covered with darker fibrils, 2–4 in. across ; flesh thin, pale yellow ; gills adnate or sinuato-adnate, golden yellow, stem covered with fibrils that blacken with age.

Readily known by the golden yellow gills.

On rotten stumps, etc.

*P. tessulatus*.—Cap horizontal, compact, thick, convex, then plane, depressed behind in lateral forms, rather irregular, smooth, pallid tawny, marked with paler roundish or polygonal spots, 3–4 in. across ; gills sinuate, adnexed, thin, crowded, white, becoming tinged yellow ; stem solid, very excentric, curved, smooth, white, about 1 in. long.

Allied to *P. ulmarius*, but more irregular in form, smaller, and with a smell of new meal.

On trunks. Solitary or tufted.

*P. subpalmatus*.—Cap thick, soft, convex, then more or less flattened, irregularly circular, obtuse, wrinkled, with a gelatinous cuticle, rufescent, 3–5 in. across ; gills adnate, broad, crowded, joined behind, dingy ; stem excentric or almost lateral, but the cap is always marginate behind, fibrillose, short, fleshy, fibrous.

Very remarkable for having the flesh marbled is in *Fistulina hepatica*. Cap, especially when young, covered with a viscid pellicle.

On old trunks, squared timber, etc.

*P. craspedius*.—Cap more or less excentric, sometimes almost lateral, but always marginate behind, depressed behind when very excentric, brick-red or tan-colour after rain, becoming pale, also sometimes greyish, smooth, edge at first incurved, then expanded and crenately lobed or fimbriate, 3–6 in. across ; gills adnate, very thin, crowded, narrow, at length torn, white ; stem sometimes very short, at others up to 3 in. long, firm, elastic, pallid, usually smooth.



Distinguished by the very thin, crowded, adnate gills.

On rotten trunks.

*P. fimbriatus*.—Cap more or less plane, then depressed, the edge becoming broken up into lobes and crenate, even, whitish, hygrophanous and almost hyaline, 2–3 in. across; gills adnate, thin, narrow, much crowded, forked; stem more or less excentric, compressed, downy, not rooting, about 1 in. long.

On trunks. Gregarious or tufted.

*P. ruthæ*.—Cap more or less fan-shaped or tongue-shaped, upper stratum gelatinous, rather hispid, whitish or yellowish buff, edge thin, often striate, 1½–3 in. across; gills ending definitely, anastomosing behind, white, then reddish; stem either distinctly lateral or the cap marginate behind, short, rather stout, reddish, hispid.

Differs from *P. pantoleucus* by the gills being determinate—ending definitely and not decurrent—and anastomosing behind.

On sawdust, etc.

*P. lignatilis*.—Cap rarely regular, usually more or less excentric, often reniform, convex, then plane, obtuse and often umbilicate, floccosely mealy, edge incurved, then wavy, dingy white, 2–6 in. across; gills adnate, much crowded, narrow, white; stem sometimes 2–3 in. long, sometimes only 3–4 lines long, always slender, curved, whitish, everywhere downy, base rooting, rarely central, sometimes quite lateral.

Very variable, shape inconstant, substance thin, tough, strong smell of meal, dingy whitish.

On trunks, rotten wood, etc. Densely tufted, rarely solitary.

*P. circinatus*.—Entirely white. Cap orbicular, horizontal, rather thick, pliant, convex, then flattened and more or less discoid, covered with a whitish silkiness, about 3 in. across; gills slightly decurrent, crowded; stem equal, central or slightly excentric, commonly straight, smooth, elastic, base rooting.

Regular, entirely white, smell weak, pleasant.

On rotten birch wood, etc. Solitary.

\*\*\* *Veil absent; gills decurrent; stem distinct and almost vertical.*

*P. pantoleucus*.—Entirely white. Cap excentric, spoon-shaped or somewhat elliptical, even, smooth, marginate and depressed behind, edge even, entire; gills decurrent, crowded, not forked nor anastomosing behind; stem ascending, solid, not rooting, not 1 in. long.

Constantly white; very excentric.

On trunks.

*P. sapidus*.—Tufted, or several caps appearing to spring from a branched stem. Cap fleshy, excentric, irregular, convex or obtusely gibbous, then depressed, smooth, white or brownish, 1–3 in. across;

gills decurrent, rather distant, narrow, whitish ; stem stout, several usually springing from a thickened knob, whitish, 1–2 in. long.

Remarkable for the branched stem.

On elm trunks, etc.

*P. mutilus*.—Cap rather thick, soft, irregularly circular in outline and slightly depressed, but very variable in form, smooth, silky when dry, white, up to 1 in. across ; gills decurrent, somewhat crowded, narrow ; stem slender, expanding upwards, excentric or almost lateral, smooth, white, about  $\frac{1}{2}$  in. long.

On the ground among grass, also on dead wood.

\*\*\*\* *Veil absent ; gills decurrent ; stem lateral, short or absent.*

*P. ostreatus* (Pl. XVII, fig. 6).—Cap fleshy, soft, at first convex and horizontal, then expanded and ascending, more or less oyster-shell-shaped, smooth, moist, even, but the cuticle sometimes torn into squamules, almost blackish when young, then brownish grey, clear bluish grey, or lavender-flower-colour, often yellowish when old, 3–6 in. across ; gills decurrent, broad, whitish, anastomosing behind to form an irregular network ; stem short or almost obsolete, lateral, white, and downy.

Stem sometimes almost central. Known from all species except *P. corticatus* by the gills anastomosing behind and forming an irregular shallow network, and from *P. corticatus* by the absence of a ring on the stem.

Smell strong.

On trunks. Tufted and imbricated. Edible.

*P. revolutus*.—Cap fleshy, firm, dry, elastic, convex, then flattened and depressed in the centre, edge incurved, smooth, rather shining, smoky yellow, then dull lead or mouse-colour, centre darkest, 4–7 in. across ; gills decurrent, rather narrow and crowded, white, edge minutely toothed ; stem lateral, whitish, smooth or downy, stout, about 1 in. long.

On beech trunks.

var. *anglicus*.—Size and habit of the typical form, but differing in the edge of the cap being very slightly or not at all incurved and in the gills being pallid ochraceous.

On trunks.

*P. salignus*.—Cap subdimidiate, horizontal, at length depressed behind, and strigose or hairy, edge entire, incurved, pale yellow-brown or dusky, 2–4 in. across ; gills not distinctly decurrent, crowded, pale dingy-pallid, edge often broken ; stem always short, firm, more or less downy.

Readily known by the cap being pulvinate when young, then becoming depressed and hirsute ; gills thinner and more crowded than in the genus, dingy smoke-colour.

On rotten trunks, especially willow. Not tufted.



## PLATE XVII

1. CLITOCYBE PHYLLOPHILA.
2. CLITOPILUS PRUNULUS
3. ENTOLOMA NIDOROSUM
4. LEPTONIA LAMPROPODA
5. CLAUDOPUS VARIABILIS
6. PLEUROTUS OSTREATUS





PLATE XVII.





*P. acerinus*.—Cap somewhat circular, convex or almost plane, flesh thick at the disc, elsewhere thin, silkily downy, shining white, 1–4 in. across ; gills decurrent, very much crowded, thin, white or yellowish ; stem very excentric, almost lateral, slender or almost obsolete, downy.

On trunks. Tufted or solitary.

#### B.—DIMIDIATI

*P. petaloides*.—Cap ascending, somewhat obovate or spathulate, almost plane, depressed behind and running into the stem where it is downy, rest glabrous, brownish, becoming pale, edge at first inturned, then expanded, 1–2 in. across ; gills decurrent, very much crowded, whitish, then grey ; stem solid, about  $\frac{1}{2}$  in. long, sometimes very short, compressed, downy, exactly lateral, whitish.

Cap entire, stem channelled in large specimens, colour of cap variable. Taste bitter.

On trunks.

*P. serotinus*.—Cap thick, convex and gibbous, then plane and ascending, reniform or obovate, even, smooth, with a viscid pellicle in wet weather, yellowish green, sooty olive, etc., edge incurved, then spreading and wavy, 1–3 in. across ; gills not truly decurrent, narrow, crowded, typically yellow, but sometimes tinged pink, or pallid, edge with sooty points ; stem lateral, solid, up to 1 in. long, or almost absent, thick, deformed, yellowish, with scattered sooty squamules which form a crowded zone near the gills.

On trunks. Gregarious or imbricately tufted.

*P. pulmonarius*.—Cap thin, soft, slightly convex, obovate or reniform, smooth, greyish or tan-colour, about 2 in. long by 1 in. broad ; gills slightly decurrent, narrow, simple, whitish, then livid ; stem lateral, round, very short, downy.

Differs from *P. serotinus* in the very short stem and smooth cap.

On trunks. Solitary.

var. *juglandis*.—Sessile, smaller than the typical form, gregarious.

On walnut trunks.

*P. mitis*.—Cap thin, tough, white, horizontal, reniform, even, smooth, without a viscid pellicle, whitish or with a rufescent tinge,  $\frac{1}{2}$ –1 in. across ; gills adnato-decurrent, closely crowded, narrow, simple, white ; stem distinctly lateral, up to  $\frac{1}{2}$  in. long, sometimes very short, compressed and broadened upwards, powdered with white squamules.

Resembling *Panus stypticus* in size and habit ; differing in the smooth cap and white colour.

On fallen branches of conifers, etc.

*P. gadinoides*.—Cap rather fleshy, horizontal, semicircular or cockle-shell-shaped, white, hygrophanous, covered with floccose down, no gelatinous stratum present, about  $\frac{1}{2}$  in. across ; gills



rather crowded and somewhat branched, white ; stem minute, lateral, or absent.

On tree-fern stem in a hothouse. Probably an exotic species.

*P. limpidus*.—Cap thin, obovate or reniform, horizontal, even, smooth, hygrophanous, white when moist, shining white when dry, not furnished with a viscid pellicle,  $\frac{1}{2}$ –1 in. across ; gills thin, crowded, white ; true stem absent, but the cap is narrowed behind into a very short stem-like base, on which the gills are decurrent.

With the habit and appearance of *P. mitis*, but entirely shining white and sessile.

On rotten beech trunks, etc.

*P. reniformis*.—Cap rather fleshy, horizontal, reniform, rather notched behind, and furnished with a very short, rudimentary stem, grey ; gills diverging from the stem-like base, thin, narrow, crowded, grey.

Stem reduced to a white, downy knob, cap thin, downy, grey, flesh thin, rather gelatinous.

On branches.

*P. lauro-cerasi*.—Cap thin, equal, sessile, horizontal and attached by a narrow base, more or less circular in outline, or cockle-shell-shaped, striate, brownish, up to  $1\frac{1}{2}$  in. across ; gills very broad at the middle, narrowed towards each end, rather thin, connected by veins, edge wavy, whitish.

Cap strongly striate or grooved.

On stems of cherry laurel.

*P. tremulus*.—Cap thin, dimidiate, somewhat horizontal, reniform, plane, depressed and often downy behind, the remainder smooth, even, greyish brown, becoming pale, hygrophanous, about  $\frac{1}{2}$  in. across ; gills adnate, appearing to be decurrent from the depression of the cap, narrow, distant, very unequal, grey ; stem distinct, exactly lateral, about  $\frac{1}{2}$  in. long, or sometimes very short, dilated upwards, attached by fibrils to mosses.

Variable. Entire fungus grey. Differs from *P. reniformis* by the presence of a distinct stem.

On mosses and on the ground.

*P. acerosus*.—Cap very thin, reniform or almost orbicular, plane, somewhat lobed, striate, hygrophanous, greyish, when dry with a white silkiness, up to 1 in. across ; gills determinate, narrow, crowded, simple, greyish ; stem lateral, very short or almost wanting, rather coarsely downy at the base.

Very variable. Limp, greyish brown, then pale, resembling *Cantharellus lobatus* in general appearance. Fixed by spreading white mycelium when growing on *Sphagnum* in swamps.

On wood, among leaves, on bare gravel, etc.

## C.—RESUPINATI

\* *Cap fleshy, uniform in texture.*

*P. porrigens*.—Entirely white. Cap thin, tough, sessile, at first resupinate, then more or less turned over, expanded from the base and becoming ear-shaped, fan-shaped, or almost circular, smooth, base more or less downy, 2–3 in. long,  $1\frac{1}{2}$  in. broad ; gills radiating, very narrow, rather crowded.

Resembling *P. petaloides* in habit, but differing in colour, and in the absence of a narrowed, stem-like base.

On old pine trunks, etc. Usually imbricated.

*P. septicus*.—Cap downy, resupinate, at first closely pressed to the wood on which it grows, with a minute, downy stem, 1–2 lines long, which soon disappears, leaving the cap reflexed, and apparently sessile, shining white, up to  $\frac{1}{2}$  in. across ; gills radiating from the point of attachment of the stem, rather distant and broad, white.

Superficially resembling *Claudopus variabilis*, differing in the persistently white gills. Differs from other small white species by the thicker cap, gills radiating from the point of attachment, and by the gills being first uppermost and then turned over.

On wood, branches, twigs, decaying fungi, dung, etc.

\*\* *Cap fleshy, striate, upper layer gelatinous.*

*P. mastrucatus*.—Cap at first resupinate, then expanded and horizontal, often lobed, upper stratum gelatinous, brown, bristling with erect squamules ; flesh thickish ; gills radiating from the point of attachment, broad, rather distant, greyish white.

Readily known by the brown, squarrosely scaly cap.

On elm trunks. Imbricated or overlapping.

*P. atrocæruleus*.—Cap at first resupinate, soon reflexed and horizontal, obovate or reniform, downy, rarely almost smooth, wrinkled when dry, usually blackish blue, rarely brownish, 1–2 in. long, 1 in. broad ; flesh soft, upper layer slightly gelatinous, rather thick, blackish brown, lower layer or flesh proper whitish ; gills at first radiating from a point, then converging towards the base, broad, whitish, at length tinged yellow.

Smell very pleasant. Sessile, gregarious or imbricated.

On rotten trunks of beech, poplar, etc.

*P. leightoni*.—Cap rather thick, at first obliquely conical, umber, then lead-colour, scurfy or bristly, upper layer gelatinous, about  $\frac{1}{2}$  in. across ; gills radiating from the point of attachment of the cap, rather thick, distant, tan-colour, somewhat wavy.

On wood.

*P. rufipes*.—Cap dimidiate or reniform, thin, convex, very glutinous when moist, white, disc salmon-colour, edge inturned, about  $\frac{1}{8}$  in. diameter ; gills adnate, broad, distant, white ; stem becoming recurved, viscous, reddish, base downy.

On wood.



*P. algidus*.—Cap rather fleshy, at first resupinate, then expanded and horizontal, reniform, covered with a thin viscid cuticle, smooth, reddish brown, about 1 in. across ; gills radiating from the point of attachment of the cap, rather broad, crowded, yellowish.

Cap grey, umber or reddish brown, often pruinose when young.  
On trunks. Often tufted or imbricated.

*P. fluxilis*.—Cap rather fleshy, sessile, reniform, very slightly depressed behind, even, pale umber, gelatinously viscid, up to  $\frac{2}{3}$  in. across ; gills diverging from the point of attachment of the cap, distant, few, simple, white.

On mosses, growing on trunks, also on sawdust.

*P. cyphellæformis*.—Cap rather fleshy, sessile, cup-shaped, more or less pendulous, upper layer gelatinous, grey, edge paler, sprinkled with a few mealy scales, very minutely downy, especially at the base, up to  $\frac{1}{2}$  in. across ; gills narrow, distant, pure white.

Gregarious, resembling a *Cyphella* in habit.

On dead stems of herbaceous plants.

*P. applicatus*.—Cap cup-shaped and orbicular when young, usually sessile and fixed by the downy base, rarely with a very short, rudimentary stem, greyish brown, up to  $\frac{1}{2}$  in. across ; gills radiating from a central point, scanty, rather thick, distant, paler than the cap, edge whitish.

Cap reflexed when adult, but never truly dimidiate, colour variable, blackish blue, dark or ashy grey.

Known amongst the minute species by its dingy colour.

Somewhat resembling *P. tremulus*, but known by the absence of a distinct stem.

On rotten wood.

\*\*\* *Cap membranaceous, not viscid.*

*P. hobsoni*.—Thin and delicate, reniform or semicircular, horizontal, plane, grey, minutely downy, 2–4 lines across ; gills rather distant, radiating from the point of attachment of the cap, pallid.

Differs from *P. applicatus* in being horizontal and plane, not cup-shaped, and much paler in colour.

On stumps, branches, etc.

*P. striatulus*.—Cap very thin, pale brownish grey, more or less concave, flaccid, smooth, striate, sessile, 2–3 lines across ; gills broad, few, distant, greyish, radiating from an excentric point.

Known among the minute grey forms by the smooth, striate cap. Variable in form, obconically campanulate and pendulous when growing on the under side of trunks ; imbricated and reflexed, or irregular. Contracted and difficult to see when dry.

On fallen branches, wood, etc.

*P. hypnophilus*.—Cap very thin, resupinate, flat, white, somewhat reniform, nearly smooth, 2–4 lines across ; gills radiating from the point of attachment of the cap, narrow, distant.

Known amongst the small species of *Pleurotus* by the smooth cap. Closely resembles *Claudopus variabilis*, one of the pink-spored species, but the gills remain permanently white.

On moss, fallen leaves, etc.

*P. chioneus*.—Cap very thin, partly resupinate, snow-white, downy, 2–3 lines across; stem lateral, very short, downy, at length almost disappearing; gills radiating from an excentric point, rather broad, with intermediate shorter ones, pure white.

Somewhat resembling *P. septicus*, but smaller, with a less distinct stem, and the flesh of the cap much thinner. Differs from *P. hypnophilus* by the villose or downy cap.

On wood, dung, leaves, etc.

### CANTHARELLUS

Cap regular, excentric or variously lobed, fleshy or membranaceous; gills more or less decurrent, thick, rather waxy, narrow, edge blunt; stem central, lateral or absent; spores white.

A very variable yet readily recognized genus, most closely resembling *Craterellus*, which differs in the absence of true gills. The most marked feature are the blunt, fold-like gills, which are decurrent, forked, straight, and rarely anastomosing.

\* *Cap entire; stem central.*

*C. cibarius*.—Every part of the fungus opaque yellowish buff. Cap very fleshy, irregular and wavy, at length broadly gibbous or turbinate,  $1\frac{1}{2}$ –3 in. across; gills decurrent, quite narrow, thick, distant; stem stout, gradually expanding into the cap, solid, 1–2 in. long.

Deep yellowish buff, sometimes paler, at others almost yolk-of-egg-colour. Smell very agreeable when dried, like that of apricots, scarcely appreciable when fresh. Taste rather pungent. Edible. The gills are like thick veins, frequently forking.

In woods. Common.

*C. friesii*.—Cap rather thin, convex, then more or less depressed, downy, pale opaque buff-orange,  $\frac{3}{4}$ – $1\frac{1}{2}$  in. across; gills decurrent, thickish, narrow, forked, colour of the cap or paler; stem solid, expanding upwards into the cap, paler than the cap, base whitish, about  $\frac{3}{4}$  in. long.

Intermediate between *C. cibarius* and *C. aurantiacus*, with the gills of the former and the habit of the latter.

In woods. Rare.

*C. aurantiacus*.—Cap rather thin and more or less depressed and wavy, soft and rather downy, dingy opaque orange, sometimes paler, 1–2 in. across; gills decurrent, crowded, thin, forked, brighter orange than the cap; stem slightly thickened upwards, coloured like the cap, base often darker, up to 1 in. long.



Slender, the gills are thinner than usual and the fungus is considered by some as being a *Clitocybe*.

On heaths and in fir woods, etc.

*C. brownii*.—Entirely ochraceous white or cream-colour. Cap thin, orbicular, obtuse or slightly umbonate, rather silky, about  $\frac{1}{2}$  in. across; gills subdecurrent, very narrow, rather distant, simple or forked; stem slender, tough.

Differs from a typical *Cantharellus* in the almost simple, very narrow, not decurrent gills.

Among grass.

*C. carbonarius*.—Cap thin, pliant, usually irregular, umbilicate or deeply depressed, squamulose, bay, then blackish,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills decurrent, straight, narrow, white; stem more or less rooting, sometimes branched and bearing 2–3 caps, white or greyish, 1–3 in. long.

A variable species, but known by the depressed blackish cap whitish gills and rooting stem which is often branched.

On charcoal or on the ground where charcoal has been burnt

*C. umbonatus*.—Cap fleshy, expanded, umbonate, then depressed, rather flocculose, grey, then blackish, up to 1 in. across; gills decurrent, crowded, straight, shining white; stem elastic, base downy, paler than the cap, 2–3 in. long.

Differs from *C. carbonarius* in the stem not being rooting, and in the more regular cap.

Among moss, etc., in woods.

*C. albidus*.—Cap thin, more or less infundibuliform, irregular and wavy, indistinctly zoned, whitish or with a tinge of yellow; gills decurrent, thin, rather crowded, repeatedly forked, white; stem smooth, white,  $1$ – $1\frac{1}{2}$  in. long.

Tough. White or tinged yellow, somewhat zoned.

In pastures among moss, etc.

*C. tubæformis*.—Cap thin, pliant, infundibuliform, waved and lobed, flocculose, yellowish brown, then pale; gills slightly decurrent, thick, distant, often branched, smoky yellow; stem almost equal, often compressed and lacunose, smooth, hollow, dull tawny-orange, 2–3 in. long.

Distinguished from *C. infundibuliformis* in the deeply umbilicate, broader, usually waved and lobed cap, and in the cavity of the cap not opening into, and being continuous with the cavity of the stem.

On the ground in woods, also on rotten wood.

var. *lutescens*.—Stem equal or narrowed upwards, cap convex, umbilicate, regular, almost even; gills forked.

Intermediate between *C. tubæformis* and *C. infundibuliformis*.

*C. infundibuliformis* (Pl. XVIII, fig. 1).—Cap thin, umbilicate, then infundibuliform, usually perforated at the base and opening into the hollow of the stem, floccosely wrinkled, yellowish grey

or smoky when moist, pale when dry, at length wavy,  $1-2\frac{1}{2}$  in. across ; gills decurrent, thick, distant, forked, straight, yellow or grey, at length pruinose ; stem hollow, smooth, yellow, 2-3 in. long.

On the ground and on rotten wood. Gregarious.

*C. cinereus*.—Cap thin, pliant, infundibuliform, pierced at the base and continuous with the hollow stem, squamulose, smoky brown, then blackish,  $1-2$  in. across ; gills decurrent, narrow, thick, distant, grey ; stem gradually widening upwards, hollow, paler than the cap,  $1\frac{1}{2}-2$  in. long.

Closely resembling *Craterellus cornucopioides*, but distinguished by the distinct gills.

On the ground in woods.

*C. houghtoni*.—Cap thin, convex, umbilicate, edge often wavy and upturned, smooth, pallid white,  $\frac{2}{3}-1\frac{1}{2}$  in. across ; gills very slightly decurrent, narrow, with a pale pink tinge ; stem whitish,  $1\frac{1}{2}-2$  in. long.

Cap dirty white, sometimes tinged flesh-colour ; stem rooting.

On the ground.

*C. leucophæus*.—Cap very thin, pliant, infundibuliform, smooth, dusky brown, edge usually incurved, about 1 in. across ; gills decurrent, distant, narrow, white ; stem stuffed, smooth, paler or similar to the cap in colour, about 1 in. long.

Regular in form, resembling *C. cinereus*, but smaller.

On the ground.

*C. cupulatus*.—Cap thin, plane, then depressed or infundibuliform, often wavy, hygrophanous, pale brown or rufescent, edge striate when moist, flocculose and not striate when dry, about  $\frac{1}{2}$  in. across ; gills decurrent, very distant, grey ; stem polished, colour of the cap, about 1 in. long.

Easily known by its small size, rufescent cap and stem and grey gills.

On the ground.

*C. stevensoni*.—Cap orbicular, umbilicate, pallid, smooth, edge incurved, thin, about  $\frac{1}{3}$  in. across ; gills decurrent, pallid ; stem slender, pulverulent, white, up to  $\frac{1}{2}$  in. long.

Near to *C. cupulatus*, but differs in habitat.

On rotten wood among moss.

*C. replexus*.—Cap thin, campanulate, then expanded and the edge turned up, striate, brownish, then grey,  $\frac{1}{2}-1$  in. across ; gills very slightly decurrent, distant, connected by veins to form a network, distant, white, then glaucous ; stem smooth, thin, hollow,  $1\frac{1}{2}-2$  in. long.

On the ground.

var. *devexus*.—Differs from the type in having the edge of the cap bent down, and unbranched grey gills.

On scorched ground.



## PLATE XVIII

1. CANTHARELLUS INFUNDIBULIFORMIS
2. SECTION THROUGH FIG. 1
3. LENTINUS LEPIDEUS
4. SECTION THROUGH FIG. 3
5. PANUS TORULOSUS
6. „ STYPTICUS
7. CANTHARELLUS CIBARIUS



PLATE XVIII.





\*\* *Stem lateral, or springing from the edge of the cap.*

*C. muscigenus*.—Cap thin, flaccid, more or less spoon-shaped, horizontal and often depressed behind, smooth, usually zoned, yellowish brown, then greyish white when old and dry,  $\frac{1}{4}$ – $\frac{1}{2}$  in. across; gills radiating, distant, branched, narrow, coloured like the cap; stem lateral, slender, base downy, 1–2 lines long.

Differs from *C. retirugis*, which also grows on mosses, by the presence of a stem, and from *C. glaucus* by its habitat and brownish colour when moist.

Growing attached to the larger mosses, *Hypnum*, etc.

*C. glaucus*.—Entirely grey. Cap thin, strap-shaped or fan-shaped, silky, not zoned, up to  $\frac{1}{2}$  in. across; gills radiating from the point of attachment of the stem, distant, narrow, thick, forked; stem lateral, expanding into the cap, slightly pruinose, about 1 line long.

Distinguished from *C. muscigenus* by growing on the ground, and being altogether grey.

On the ground in damp places.

\*\*\* *Cap quite sessile, resupinate or gills uppermost.*

*C. retirugis*.—Cap thin, more or less fan-shaped or irregular, edge wavy and lobed, greyish white, subsessile or rarely extended behind into a short, flattened, stem-like base, attached by fibrils,  $\frac{1}{4}$ – $\frac{3}{4}$  in. across; gills radiating from the centre, very thin, anastomosing.

Growing on mosses, *Hypnum*, etc.

*C. lobatus*.—Cap thin, horizontal, more or less orbicular, edge deeply lobed, sessile, brownish, pale when dry; gills radiating from a point, thick and fold-like, branched, distant.

Cap  $\frac{1}{2}$ –1 in. across, distinguished by being quite sessile, and edge of cap deeply lobed.

Growing on mosses in swamps, etc.

#### NYCTALIS

Cap symmetrical; gills adnate or decurrent, thick, soft, edge blunt; stem central; spores colourless.

Parasitic on the larger fungi. The cap is densely mealy, due to the presence of numerous large conidia.

*N. parasitica*.—Cap conical, then expanded, unequal, densely mealy, due to the presence of a layer of conidia, grey, up to  $\frac{3}{4}$  in. across; gills adnate, thick, distant, anastomosing, brownish; stem often wavy, downy, whitish, 1–3 in. long.

Growing on *Russula adusta*, *R. foetens*, etc. Gregarious. The large conidia on the cap are elliptical and smooth.



*N. asterophora*.—Cap fleshy, conical, then hemispherical, mealy owing to the presence of numerous conidia, white, then tinged fawn-colour, about  $\frac{1}{2}$  in. across; gills adnate, distant, narrow, forked, straight, dingy; stem slender, often twisted, white, then brownish, somewhat mealy,  $\frac{1}{2}$ –1 in. long.

Growing on old, blackened specimens of *Russula nigricans*. The surface of the cap bears a dense mass of large, stellate conidia, a true form of conidial reproduction, which on germination produce the fungus.

*N. caliginosa*.—Cap fleshy, white and mealy when dry, about  $\frac{1}{2}$  in. across; gills decurrent, thick, branched; stem white, pruinose, inside brown, base swollen, about 2 in. long.

On the ground in dark places amongst fallen leaves. Clustered. A doubtful species. Perhaps only a diseased condition of some *Clitocybe*.

#### LENTINUS

Cap tough, becoming dry and hard when old, not soon decaying, always more or less irregular; gills more or less decurrent, tough, thin, edge minutely toothed or irregular; becoming dry; stem firm, central, excentric, lateral or absent; spores white.

Allied to *Panus* in the dry consistency and in drying up, and not deliquescing at maturity. Differing in the toothed or eroded edge of the gills. All grow on wood.

\* *Cap more or less symmetrical; stem distinct.*

*L. tigrinus*.—Cap generally symmetrical, thin, tough, convexo-plane, then more or less funnel-shaped, whitish, with darker adpressed scales, 1–3 in. across; gills decurrent, narrow, crowded, white, edge minutely toothed; stem usually narrowed below, squamulose, whitish, apex with a ring which soon disappears, 1–2 in. long.

Altogether more slender than *L. lepideus*, and more coriaceous and regular.

On dead wood, etc.

*L. dunalii*.—Cap coriaceous, thin, umbilicate, edge often wavy, pallid with spot-like scales which fall away leaving the cap smooth, 1–2 in. across; gills decurrent, crowded, rather narrow, pallid; stem somewhat silky, solid, about  $\frac{2}{3}$  in. long.

Allied to *L. tigrinus*; ring on stem very rudimentary.

On trunks, etc. More or less tufted in habit.

*L. lepideus* (Pl. XVIII, fig. 3).—Cap fleshy, tough, convex, then more or less depressed and unequal, whitish or pale ochre, becoming broken up into darker adpressed squamules, 2–3 in. across; gills decurrent, slightly sinuate, transversely striate, edge irregularly toothed, whitish or with a yellow tinge; stem tapering to a rooting base, hard, pale, squamulose, veil very soon disappearing, 1–3 in. long.

A showy fungus when well grown, firm, usually more or less deformed and somewhat excentric. Smell pleasant. Often much deformed, and assuming very grotesque forms when grown in dark places, as on wood in cellars, on pit-props, etc.

On trunks, stumps, etc.

*L. leontopodius*.—Cap fleshy, tough, very excentric, sometimes almost lateral or dimidiate, broadly umbilicate, edge arched and curved down, more or less lobed, downy, pale reddish ochre, margin darkest, 4–8 in. across, flesh up to  $\frac{3}{4}$  in. in thickness at the centre of the cap, becoming thinner towards the edge ; gills deeply decurrent on the under side of the stem, reddish ochre, edge darker, and very minutely toothed ; stem hard, curved, brown, scurfy, base often blackish, 3–4 in. long.

The largest and finest species included in the genus. Smell pleasant. Taste sweet.

On willow trunks, etc. Rare.

*L. pulverulentus*.—Cap thin, tough, convex, yellow, about 2 in. across, infundibuliform or irregularly fan-shaped, pulverulent ; gills decurrent, pallid, edge crenulate ; stem stout, elongated, equal, yellow, and powdered with white meal.

On trunks. Tufted.

*L. resinaceus*.—Cap rather fleshy, tough and pliant, excentric, convex, then depressed, edge incurved and lobed, downy, covered with resinous gum, ochraceous cinnamon, 1–2 in. across ; gills adnato-decurrent, crowded, narrow, white, edge toothed ; stem firm, solid, expanding into the cap, downy, pallid, scarcely 1 in. long.

On trunks. Somewhat tufted, stems often more or less grown together.

*L. adhærens*.—Cap thin, tough, irregular, pitted, downy, pale and dingy, glutinous, convex and somewhat umbonate, then depressed, about 1 in. across ; gills forming decurrent lines on the stem, thin, torn, white ; stem rooting, glutinous, coloured like the cap.

Small, unequal, taste astringent. Cap and stem appearing as if varnished, from the gluten.

In pine woods.

*L. cochleatus*.—Cap tough, limp, irregular, more or less lobed or twisted, often depressed or funnel-shaped, reddish cinnamon, 1–2 in. across ; gills somewhat decurrent, crowded, soft, edge toothed, pinkish white ; stem variable, several often more or less grown together, colour of cap or paler.

Smell fragrant, resembling aniseed, sometimes almost absent. Usually much tufted and contorted.

On trunks, stumps, etc.



\*\* *Cap with a lateral stem, or sessile.*

*L. scoticus*.—Cap thin, soft, variable in form, plane, umbilicate or funnel-shaped, smooth, pallid or brownish, hygrophane, 1–2 in. across; gills decurrent when a stem is present, rather distant, strongly toothed, pallid; stem very excentric or lateral, springing from brown mycelium, very variable in length.

Without any fragrant smell. Edge of cap often lobed.

On furze, birch, etc. Solitary or tufted.

*L. fimbriatus*.—Cap thin, pliant, somewhat dimidiate, depressed behind, whitish or pale fawn-colour,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, edge whitish with darker scales; gills narrow, tinged brown, edge toothed and torn; stem whitish, curved, up to  $\frac{1}{4}$  in. long.

The smallest of British species.

On a stump standing in a pond. Very rare.

*L. vulpinus*.—Cap sessile, or extended behind into a short, stem-like base, imbricated, tough, orbicular or shell-shaped, grown together behind, wrinkled and rough with minute points, pale tan-colour, 1–2½ in. across; gills broad, white, edge torn.

On trunks and stumps. Inodorous.

*L. flabelliformis*.—Cap thin, flabby, and tough, almost sessile, reniform or kidney-shaped, plane or more or less depressed behind, smooth, even, fawn-colour or pale cinnamon, edge more or less crenulate, 1–2 in. across; gills rather broad, often torn, pallid.

On trunks and stumps. Tufted or imbricated.

## PANUS

Entire fungus leathery and tough, drying up and not decaying quickly; cap irregular in form, stipitate, sessile, and horizontal, or altogether resupinate; gills more or less decurrent, unequal, dry, edge quite entire; stem central, excentric or absent.

Allied to *Lentinus*, but distinguished by the entire edge of the gills.

\* *Stem excentric.*

*P. conchatus*.—Cap tough and flexible, unequal, excentric, edge often lobed, cinnamon-colour, becoming pale and more or less squamulose, flesh thin, up to 3 in. across; gills narrow, somewhat branched, pinkish white, then pale ochre, forming decurrent lines down the stem; stem very short, base downy.

Often imbricated and the caps more or less grown together; gills crisped or wavy when dry.

On trunks of beech, poplar, etc.

*P. torulosus* (Pl. XVIII, fig. 5).—Cap tough and pliant, plane, infundibuliform or dimidiate, edge often very wavy, tinged flesh-colour, then ochraceous, not scaly, 2–3 in. across; gills decurrent, narrow, rather distant, not branching behind, ruddy, then pale buff; stem  $\frac{1}{2}$ –1 in. long, solid, oblique, densely covered with grey down.

Differs from *P. conchatus* in the densely downy stem, which is often more or less tinged violet, as is also the cap. Very variable in shape ; flesh thicker than in *P. conchatus*.

Common on dead birch trunks, stumps, etc.

*P. rudis*.—Clustered, cap depressed, reddish tan, bristling with small tufts of hairs, 1–2 in. across, gills narrow, running down the short, downy stem. Smell spicy. On wood.

\*\* *Stem lateral, or springing from the edge of the cap.*

*P. stypticus* (Pl. XVIII, fig. 7).—Thin, pliant, more or less kidney-shaped, cinnamon or yellowish buff, cuticle broken up into mealy granules,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across ; gills narrow, rather crowded, connected by thin ridges, cinnamon, radiating from the point of attachment of the flattened stem ; stem lateral, very short, flattened.

Usually densely imbricated, the short stems being crowded together. Taste hot and pungent.

On decaying stumps, trunks, etc.

*P. albido-tomentosus*.—Cap semicircular, horizontal, sometimes wavy, thin and pliant, pale umber and densely covered with short, whitish, velvety down, scanty towards the incurved edge, about  $\frac{2}{3}$  in. across ; gills radiating from the point of attachment, honey-coloured ; stem lateral, very short or entirely absent.

On trunks, etc. Often growing in imbricated clusters.

*P. farinaceus*.—Rather smaller than *P. stypticus*, dusky cinnamon, broken up into greyish white scurf, which falls away ; gills free, distinct, pale ; stem short, lateral.

On wood.

\*\* *Cap resupinate, sessile or produced to a point of attachment behind.*

*P. patellaris*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, attached by its back, gills uppermost, narrow, crowded, yellowish, radiating from a nearly central point.

Grows flat and pressed to dead wood.

*P. stevensoni*.—Cap spoon-shaped, yellow with an olive tinge ; gills narrow ; stem dilated above, convex, golden, downy ; flesh greenish yellow.

A minute fungus, growing on dead wood.

#### XEROTUS

Cap dry, thin, tough ; gills very narrow, resembling folds, forked, edge entire, thick ; stem central or excentric ; spores white.

The very thin, leathery cap, and narrow, forked, fold-like gills mark this from every other British genus of agarics. Most closely allied to *Cantharellus*, and resembling the smaller species of *Craterellus*.



*X. degener.*.—Cap about 1 in. across, thin and tough, somewhat funnel-shaped, but the edge flattish, greyish bay and striate when moist, somewhat zoned, about 1 in. across; gills few, decurrent, distant, some forked, greyish white; stem up to 1 in. long, brown with white down.

Very tough, cap plane, becoming funnel-shaped, flocculose and zoned when dry.

On gravelly ground, etc. Very rare.

#### LENZITES

Cap corky and coriaceous, growing horizontally, sessile, and attached by a narrowed portion behind; gills coriaceous, tough, simple or branched, sometimes joined to form irregular pores here and there, radiating from the point of attachment; spores white.

Differing from the sessile, horizontal kinds of agarics, as *Pleurotus*, in the thicker, coriaceous, somewhat elastic gills. Allied in texture to *Dædalea*, but the gill idea is more marked than in that genus. Coriaceous, perennial, or persistent, that is, not decaying at once as in agarics.

*L. betulina.*.—Cap more or less kidney-shaped or fan-shaped, horizontal, attached by an expanded base, corky, pallid or tinged brownish, slightly zoned, 1–3 in. broad; gills thin, forked, and joining on to each other, straight, dingy white.

Cap downy, usually indistinctly zoned.

On trunks and stumps, especially birch.

*L. flaccida* (Pl. XXX, fig. 5).—Cap horizontal, semicircular or more or less fan-shaped, narrowed behind to the point of attachment, hairy, zoned, tinged grey or brown, 1–2 in. broad; gills broad, crowded, straight, branched, whitish.

Differs from *L. betulina* in the coarsely hairy, thin flesh of the cap, and the thick, straight gills.

On trunks and stumps.

*L. sepiaria.*.—Cap horizontal, hard, zoned, hairy, wrinkled, bay or umber, thick; gills thick, branched, and growing into each other, yellowish.

Hard, orbicular or elongated, 1–3 in. broad, becoming dark brown or blackish when old.

On fir trunks, stumps, posts, etc.

*L. abietina.*.—Cap horizontal, thin, spreading on the matrix with a free-spreading portion, at first with dark umber down, then almost smooth and hoary, 1½–5 in. long, about 1 in. broad; gills decurrent when effused on the matrix, simple, unequal, glaucous from a dense white bloom, due to the mass of spores.

Sometimes resupinate, always more or less effused on the matrix, sometimes spreading for a foot or more in length, with a free edge, ½–1 in. broad.

On fir trunks, posts, rails, boards, etc.

## TROGIA

Cap stemless, attached laterally, soft, dry, thin, persistent ; gills resembling folds.

*T. crispa* (Pl. XXX, fig. 7).—Cap  $\frac{1}{2}$ –1 in. across, saucer-shaped when young, then expanding, and lying almost flat on the wood, gills uppermost ; gills vein-like, thickish, narrow, edge blunt, greyish white.

Often in clusters, resembling a *Merulius*, to which genus I consider it in reality belongs. Differs from the small species of *Cantharellus* in being quite persistent, and not deliquescing and disappearing at maturity.

## SCHIZOPHYLLUM

Cap thin, dry, fibrous, stemless, narrowed to a point of attachment at the edge ; gills narrow, edge split into two recurved portions.

*S. commune* (Pl. XXX, fig. 3).—Cap more or less fan-shaped, edge often lobed, whitish, fibrous,  $\frac{1}{2}$ –1 in. across ; gills radiating from the point of attachment.

Cannot be mistaken for any other fungus if attention is paid to the split edge of the gills. The only European species, the genus is abundantly represented in the tropics. Dry and persistent for some time. On trunks and dead wood.

## Sub-Family CHLOROSPOREÆ

Structurally, this group agrees with *Schulzeria*, in the Leucosporæ. The leading features are the green gills and the green spores. Only one genus, *Chlorospora*, including one species, *C. eyrei*, occurs, so far as known, in the Old World, and that one species is confined to England. The family is better represented in the New World, where a second genus, called *Chlorophyllum*, includes species as large as *Lepiota procera*, some of which are edible.

## CHLOROSPORA

The species forming this genus have the general appearance of species of *Lepiota*, but the gills are green, due to the green spores. *C. eyrei*, a rare British species, is the only European representative of the order, which is better represented in the New World, where the species are as large as our largest species of *Lepiota*, and one species met with in British Guiana is edible, and considered a luxury.

Agreeing in structure with the genus *Pluteus* in the Rhodosporeæ.

*C. eyrei*.—Cap convex, then expanded and broadly umbonate, edge incurved at first, smooth or minutely granular, and tinged ochre



at the disc, remainder pallid, even,  $1-1\frac{1}{2}$  in. across, edge sometimes bearing fragments of the veil; gills free, narrowed behind, thin, crowded at first, then becoming rather distant, pale green, then deep bluish green; stem smooth, even, sometimes very slightly wavy, pallid, mealy upwards,  $1\frac{1}{2}-2\frac{1}{2}$  in. long; spores pale green.

Readily distinguished by the green gills.

On the ground in woods.

#### Sub-Family RHODOSPOREÆ

The agarics included in the present family are usually spoken of as the pink-spored group; as a matter of fact this is not literally true, no species having truly pink gills. The real tint varies from pale flesh-colour—that produced by a thin wash of the water-colour known as light red—to deep salmon-colour. As throughout the gill-bearing fungi, the ultimate colour of the gills is due to the colour of the mature spores, and when young the gills are colourless, as are also the immature spores. In the Rhodosporeæ the gills usually remain colourless or quite pale for some time, and in consequence often prove very perplexing to the beginner, who is apt to endeavour to run down a pink-spored fungus under the mistaken idea that it belongs to the white-spored section. If such fungi, after cutting off the stem, are placed gills downwards on white paper, and allowed to remain for some hours, the coloured spores will be clearly seen in the spore-print; the gills will also have assumed the mature salmon-coloured condition.

The present family is, numerically, the second smallest included in the Agaricaceæ. It would be an interesting problem to ascertain the reason why agarics with pink spores cannot hold their own, and extend at an even rate, to say the least, with fungi having brown or white spores. Many of the species are minute and of the lowest type of structure, whereas the most highly evolved types are few in number, and rare, not only in this country, but throughout the world.

#### ANALYSIS OF THE GENERA

##### A. *Gills quite free from the stem.*

Stem with a large, free volva surrounding its base; ring absent.

*Volvaria.*

Volva and ring both absent.

*Pluteus.*

##### B. *Gills more or less attached to the stem—adnate or adnexed.*

Gills adnexed and sinuate; edge of cap incurved when young; substance of stem fibrous.

*Entoloma.*

Gills adnexed, soon separating from the stem; edge of cap straight when young.

*Nolanea.*

Gills adnexed, soon separating from the stem; edge of cap incurved when young.

*Leptonia.*

*C. Gills decurrent.*

\* *Stem central.*

Stem obviously fibrous externally.

*Clitopilus.*

Cap umbilicate ; stem externally smooth and polished. *Eccilia.*

\*\* *Stem excentric, lateral or absent.*

All the species minute.

*Claudopus.*

#### NOTES OF THE GENERA

It has already been stated that the genera included in the various groups characterized by the colour of the spores, have the same structural features repeated under each group, that is, in each primary colour-group we find genera having the gills adnate, free, etc., respectively. In the same way there are genera in each of the primary colour-groups having a ring on the stem. From the above it will be recognized how important it is to first ascertain the colour of the spores of a fungus, because in the absence of this character, it would be impossible for the beginner to determine to which of the primary groups such fungus belonged. With experience this difficulty will disappear, because as a rule the general combination of characters, or, in other words, the general appearance of a fungus suggests the colour-group to which it belongs. Such combination of characters cannot be reduced to written terms, nevertheless they exist. In the following account of genera, the structural equivalent occurring in each colour-group will be indicated.

#### VOLVARIA

The presence of a well-developed volva and free gills stamp this genus, remembering that the spores are pink. Some of the species are large and showy, all are comparatively rare. Corresponds structurally to *Amanitopsis* in the Leucosporeæ, and to *Chitonia* (not truly British) in the Melanosporeæ.

#### PLUTEUS

Gills free, ring and volva absent. In many species the gills remain whitish for some time, and then are liable to be mistaken for white-spored species. Mostly growing on wood. Not by any means common, except *P. cervinus*. Corresponds with *Schulzeria* in the Leucosporeæ, and with *Pilosace* in the Melanosporeæ.

#### ENTOLOMA

Known amongst the Rhodosporeæ by the sinuate gills, which, as in *Pluteus*, often remain white or pallid until the fungus is full grown. The species are mostly fairly large and somewhat stout in build. They grow on the ground, and are in most abundance after prolonged rain. Corresponding structurally with the genus *Tricholoma* in the Leucosporeæ, with *Hebeloma* in the Ochrosporeæ, and with *Hypholoma* in the Melanosporeæ.

#### NOLANEA

Closely allied to *Leptonia*, differing mainly in the cap being



papillate, that is, in having a small, wart-like, more or less acute umbo, and in the edge of the cap being straight and pressed to the stem when young, and not incurved, as in *Leptonia*. The species are small, and mostly occur in pastures and open places. Agreeing in structure with *Mycena* in the Leucosporeæ, with *Galera* in the Ochrosporeæ, and with *Psathyra* and *Psathyrella* in the Melanosporeæ.

#### LEPTONIA

Mostly small, slender fungi, most abundant in open pastures after much rain; some grow in swampy places, and one of the most beautiful species, *L. euchroa*, grows on wood. Many of the species are brightly coloured, clear blue, purple and green being most prevalent. The genus agrees structurally with *Collybia* in the Leucosporeæ.

#### CLITOPILUS

In the most typical forms the plant is fairly large-sized, the cap somewhat fleshy, and the gills deeply decurrent. From this condition there is a gradual transition to the smaller species, where the whole fungus is slender, flesh of cap thin, and the gills only just decurrent. Many of the species are white or pale-coloured. Agreeing in structure with *Clitocybe* in the Leucosporeæ.

#### ECCILIA

All the species are small, and somewhat rare. Differing from *Clitopilus* in having a cartilaginous stem. Corresponding in structure with *Omphalia* in the Leucosporeæ.

#### CLAUDOPUS

Minute, membranaceous fungi, either sessile and having the gills uppermost, or with a minute, more or less excentrically placed stem. Mostly growing on wood. Agreeing in structure with the simpler, minute species of *Pleurotus* in the Leucosporeæ, with which they are often confounded, unless attention is paid to the gills being slightly tinged pink.

#### VOLVARIA

The entire fungus, when young, enclosed in a universal veil, which, after expansion of the cap, forms a loose volva, ensheathing the base of the stem. Cap regular; gills free, pale salmon-colour; stem central, ring absent.

Distinguished among pink-spored genera by the free gills, presence of a volva, and absence of a ring on the stem.

\* *Cap dry, silky or fibrillose.*

*V. bombycina*.—Cap 4–8 in. across, becoming convex and somewhat umbonate, silky, whitish; gills closely crowded, broad, becoming pale flesh-colour; stem 3–6 in. long, stout, white, volva large, torn, lax, somewhat viscid, whitish.

On trunks. Solitary or tufted.

This fungus sometimes grows to a large size. I once gathered a specimen growing on an old elm tree in Kew Gardens, measuring and weighing as follows. Cap 14 in. across when expanded, stem 8 in. long by 2 in. in thickness, gills  $1\frac{1}{2}$  in. broad. Weight  $2\frac{1}{2}$  pounds. The spores of this specimen were quite the normal size.

*V. volvacea* (Pl. XV, fig. 2).—Cap 2–3 in. across, soon expanded, greyish yellow and streaked with blackish fibrils ; gills pale flesh-colour ; stem 2–4 in. long, almost equal in thickness, white, volva large, loose.

Cap sometimes grey, but always streaked.

On the ground, also in conservatories.

*V. loveiana*.—Cap  $2-3\frac{1}{2}$  in. across, convex, silky, white ; gills pinkish salmon-colour ; stem narrowed upwards, bulbous, white, volva lobed, whitish.

Growing on the cap of distorted and decaying specimens of the fungus called *Clitocybe nebularis*.

*V. taylori*.—Cap  $1\frac{1}{2}-2\frac{1}{2}$  in. across, soon expanded, livid, edge whitish, usually striately cracked ; gills broad, pale salmon-colour ; stem about 2 in. long, smooth, whitish, volva lobed, brown outside.

Somewhat resembling *V. volvacea* ; differing in the paler cap, gills much narrowed behind, and the small brown volva.

On the ground.

\*\* *Cap more or less viscid, smooth.*

*V. speciosa*.—Cap 3–5 in. across, obtuse or slightly umbonate, even, viscid, disc grey or entirely whitish ; gills crowded, narrowed behind, pale salmon-colour ; stem 5–8 in. long, base swollen, narrowed upwards, white, downy, volva downy, white, edge irregular.

Disc of cap sometimes brownish. Known by the whitish, viscid cap, and downy stem and volva.

On dunghills and on the ground.

*V. gloiocephala*.—Cap 3–5 in. across, soon almost plane, umbonate, smooth, glutinous, smoky grey ; gills broad, pale salmon-colour ; stem 4–6 in. long, whitish, then tinged brown, volva whitish, extreme edge only free.

Known by the smoke-coloured, glutinous cap.

On the ground.

*V. parvula*.—Cap  $\frac{1}{2}-1$  in. across, becoming plane and umbonate, silky, white, umbo often tinged with colour ; gills crowded, clear pale flesh-colour ; stem  $1-1\frac{1}{2}$  in. long, silky, white, volva small, edge free and divided into 2–4 lobes.

In gardens and greenhouses. Gregarious.

*V. media*.—Cap 1–2 in. across, soon plane, obtuse, or somewhat umbonate, viscid, white, disc usually tinged brown ; gills pale salmon-colour ; stem 2–3 in. long, smooth, white, volva tinged brown, edge lobed.



## PLATE XIX

1. GALERA TENER
2. NOLANEA PASCUA
3. NAUCORIA TEMULENTA
4. PLUTEUS CERVINUS
5. TUBARIA STAGNINA
6. „ FURFURACEA
7. SECTION OF FIG. 6



PLATE XIX.





Intermediate between *V. speciosa* and *V. parvula*. Differs from the former in the smooth stem and volva ; from the latter in the stem being quite solid.

In pastures, also in woods.

*V. temperata*.—Cap about  $\frac{1}{2}$  in. across, umbonate, disc tinged tawny, remainder whitish ; gills pale salmon-colour ; stem up to 1 in. long, whitish, volva large in proportion, edge lobed, tinged brown.

On soil in greenhouses, etc.

#### PLUTEUS

Cap regular ; gills free from the stem, salmon-colour when mature ; stem central, ring and volva absent.

Growing on wood. Recognized by the free gills and absence of ring and volva, amongst the pink-gilled agarics.

\* *Cap with fibrils or down which eventually disappears, or powdery, or with glistening particles* (in other words, not perfectly smooth or glabrous when young).

*P. cervinus* (Pl. XIX, fig. 4).—Cap 2–4 in. across, soon expanded and becoming broken up into fibrillose squamules that soon disappear, smoky, with a yellow brown, or fawn-coloured tinge ; gills crowded, white, then salmon-colour ; stem 2–4 in. long, pale, with blackish fibrils.

On trunks and stumps. Solitary.

var. *patricius*.—Cap 2–3 in. across, smoky grey or fawn-colour with darker scales, at length smooth and shining and radially cracked ; stem stout, white, shining.

On logs, stumps, etc.

var. *eximius*.—Cap 4–6 in. across, umber becoming reddish, especially at the edge ; gills broad ; stem grooved upwards, fibrillose, becoming blackish.

On sawdust.

var. *petasatus*.—Cap 3–4 in. across, umbonate, greyish white, very smooth, viscid, becoming striate ; stem 4–5 in. long, whitish.

On heaps of straw and dung, sawdust, etc.

var. *bullii*.—Cap 4–6 in. across, expanded, smooth, pallid, disc darker ; gills broad ; stem 3–4 in. long, pale brown, fibrillose.

On rotten wood.

*P. umbrosus*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, becoming almost plane, downy, becoming lacunose or pitted, umber-brown, edge fimbriated ; gills flesh-colour, edge darker, fimbriated ; stem 2–3 in. long, pale, downy or squamulose, usually curved.

Differs from *P. cervinus* in the dark-edged fimbriate gills.

On trunks of fir and other trees.

*P. hispidulus*.—Cap about  $\frac{1}{2}$  in. across, soon almost plane, pilose or silky, grey ; gills rather distant from the stem ; stem 1–2 in. long, silvery white, usually curved.



Known by its small size, and grey, silky cap.

On beech trunks, etc., also on soil.

*P. ephebius*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, soon almost plane, edge naked and often wavy, rest covered with a bluish grey down; gills rather distant, yellowish salmon-colour; stem 2–3 in. long, whitish or tinged grey, smooth.

Differs from *P. cervinus* in the minutely velvety or downy cap, which is sometimes brownish violet.

On trunks, etc.

*P. salicinus*.—Cap  $\frac{2}{3}$ –1 in. across, soon almost plane and rather umbonate, bluish or with a green tinge, disc darker and floccosely rugulose; gills pinkish salmon-colour; stem about 1 in. long, bluish or greenish, then grey or white.

Differs from *P. ephebius* in the somewhat umbonate cap not being downy, and the rugulose disc.

On willow and other trunks.

var. *beryllus*.—Cap with greenish streaks. On alder.

var. *floccosa*.—Cap floccosely squamulose.

Differs from *P. ephebius* in the wrinkled disc.

*P. pellitus*.—Cap 1–2 in. across, becoming expanded and somewhat umbonate, silky-fibrous, white; gills crowded, white, then flesh-colour, edge slightly toothed; stem about 2 in. long, shining, white.

The only *Pluteus* with a pure white cap and stem. Differs from *Entoloma prunuloides* in the free gills and absence of mealy smell.

Among grass at the roots of trees, etc.

*P. nanus*.—Cap 1– $1\frac{1}{2}$  in. across, soon almost plane, umber or smoky brown, wrinkled, minutely flocculose or pruinose; gills free, but rather close to the stem, pale salmon-colour; stem 1–2 in. long, slightly striate, white.

On stumps, fallen sticks, etc.

var. *lutescens*.—Stem and gills, or the first-named only, yellowish.

var. *major*.—Larger than the typical form. Greyish.

All the forms are smaller than *P. cervinus*, but are best separated by the subglobose warted spores. In *P. cervinus* the spores are elliptical and smooth.

*P. spilopus*.—Cap 1– $1\frac{1}{2}$  in. across, subumbonate, with a depression round the umbo, radially wrinkled, brown or dark fawn-colour; gills pale salmon-colour; stem whitish or tinged fawn-colour, with scattered black points.

Distinguished by the black points on the stem.

On stumps.

*P. semibulbosus*.—Cap about  $\frac{1}{2}$  in. across, slightly mealy, coarsely striate, white; gills narrow, salmon-colour; stem about  $\frac{2}{3}$  in. long, somewhat bulbous, white.

Readily known by the fluted cap and bulbous stem.

On wood, branches, etc.

\*\* *Cap smooth and naked from the first.*

*P. violarius*.—Cap up to 1 in. across, soon nearly plane, edge often wavy, minutely velvety, dark purple; gills whitish, then bright flesh-colour, edge serrulate; stem about 1 in. long, pale umber, with black fibrils below.

On stumps, etc.

*P. roseoalbus*.—Cap 2–3 in. across, convex, then expanded, even, rosy, gills rather distant, flesh-colour; stem  $1\frac{1}{2}$ –3 in. long, stout, powdered with white meal.

Differs from *P. cervinus* in the rosy cap.

On dead or decaying trunks.

*P. leoninus*.—Cap  $1\frac{1}{2}$ –2 $\frac{1}{2}$  in. across, soon expanded, often subumbonate, smooth, yellow with a tawny tinge, edge striate; gills rather distant, yellowish pink; stem 2–3 in. long, striate, whitish.

Known by the yellowish or tawny cap with a striate edge.

On trunks. Solitary or subgregarious.

var. *coccineus*.—Cap crimson-orange or vermilion.

*P. chrysophæus*.—Cap  $1\frac{1}{2}$ –2 in. across, campanulate, then expanded, slightly wrinkled, edge striate, cinnamon-colour; gills whitish, then pale salmon-colour; stem 2–3 in. long, whitish, smooth.

Resembles *P. leoninus* in size, differing in the cinnamon-coloured cap. Often subumbonate.

*P. phlebophorus*.—Cap 1–2 in. across, soon expanded and with prominent raised veins, umber, edge even; gills white, then pale salmon-colour; stem 1–2 in. long, shining, curved as a rule, whitish.

Differs from *P. nanus* in the distinctly hollow stem and smooth cap.

On trunks, stumps, etc.

#### ENTOLOMA

Cap regular, edge incurved at first; gills adnexed, sinuate or rounded behind, spores pinkish or salmon-colour; stem central, stout, more or less fibrous.

Known amongst the pink-spored genera by the sinuate gills. Growing on the ground, appearing after heavy rains. Many species have a smell resembling that of new meal.

\* *Stem white or pallid.*

*E. sinuatum* (Pl. XX, fig. 3).—Cap up to 6 in. across, soon expanded and wavy, squamulose when dry, yellowish white; gills emarginate,  $\frac{1}{2}$ – $\frac{3}{4}$  in. broad, crowded, reddish yellow; stem 3–6 in. long, stout, fibrillose, then smooth, white.

Smell strong, somewhat resembling burnt sugar. Poisonous. Some specimens are very large, up to 10 in. across.

In woods.



## PLATE XX

- |    |          |                          |
|----|----------|--------------------------|
| 1. | ENTOLOMA | NIGROCINNAMOMEUM         |
| 2. | „        | PRUNULOIDES              |
| 3. | „        | SINUATUM                 |
| 4. | „        | THOMSONI                 |
| 5. | „        | JUBATUM                  |
| 6. | „        | SECTION OF CAP OF FIG. 5 |



PLATE XX.





*E. lividum*.—Cap 3–4 in. across, soon plane, smooth, longitudinally fibrillose, pale, livid tan ; gills almost free, pallid, then flesh-colour ; stem about 3 in. long, smooth, apex mealy, shining white.

In woods. Poisonous.

var. *roseus*.—Cap soon plane, whitish ochre, disc rosy, about 4 in. across ; gills pale yellowish flesh-colour ; stem whitish, striate.

On logs.

*E. prunuloides* (Pl. XX, fig. 2).—Cap 2–3 in. across, becoming flattened and somewhat umbonate, viscid, yellowish or livid ; gills almost free, crowded, white, then pale flesh-colour ; stem 3–4 in. long, slightly striate, smooth, white.

The cap varies to white, yellowish or pale grey, often longitudinally cracked. Resembling *E. lividum*, but much smaller. Smell very strong of new meal.

Among moss and grass, etc.

*E. repandum*.—Cap 1–1 $\frac{3}{4}$  in. across, umbonate, usually wavy, edge incurved and often lobed, silky when dry, pale ochraceous with darker streaks ; gills almost free, pale salmon-colour ; stem 1 $\frac{1}{2}$ –2 in. long, silky, white.

Among grass.

*E. bulbigenum*.—Cap  $\frac{2}{3}$ –1 in. across, hemispherical, minutely tomentosely scaly, shining white ; gills slightly adnexed, pinkish salmon-colour ; stem 2 $\frac{1}{2}$ –3 in. long, somewhat bulbous at the base, fibrillose, whitish.

The bulb at the base of the stem is sometimes marginate or with a distinct edge, at others it appears as a swelling at one side of the base of the stem.

On the ground.

*E. liquescens*.—Cap 1–2 $\frac{1}{2}$  in. across, broadly umbonate, wavy, smooth, ochraceous, disc rufous ; gills free, white, then pale, dingy lilac ; stem 2–3 in. long, white, sometimes a little wavy.

On the ground under trees.

*E. ameides*.—Cap 1–2 in. across, broadly campanulate, often irregular, with whitish flocculent fibrils, then smooth and with a silky sheen, edge often splitting, pallid reddish grey ; gills distant, wrinkled, pale salmon-colour ; stem about 1 $\frac{1}{2}$  in. long, whitish, fibrillosely striate and flocculose above.

Large specimens superficially resemble *Hygrophorus ovinus*. Smell peculiar.

In pastures.

*E. saundersii*.—Cap 2 $\frac{1}{2}$ –3 $\frac{1}{2}$  in. across, edge often lobed and up-turned, white, brownish when old ; gills distant, salmon-colour ; stem 4–5 in. long, smooth, white.

Resembles *E. majalis*, which differs in the cinnamon cap, and free, crowded, crenate gills.

Growing on the ground in groups.



*E. fertilis*.—Cap 4–6 in. across, soon plane, pulverulently scaly, pallid reddish or very pale reddish ochre, edge paler ; gills rather close, broad, pale flesh-colour ; stem 4–5 in. long, almost equal except the somewhat bulbous base, fibrillose and somewhat squamulose, whitish.

Smell resembling new meal. The largest of our species of *Entoloma*. Differs from *E. lividus* in the cap being broken up into pulverulent squamules.

On the ground in woods. Subgregarious.

*E. sericellum*.—Cap  $\frac{1}{2}$ – $1\frac{1}{4}$  in. across, often irregular, almost smooth or squamulose, silky white or tinged yellow ; gills broad, rather distant, white, then flesh-colour ; stem 1–2 in. long, fibrillose, then smooth and polished, white.

Differs from *E. speculum*, the only other white species, in the silky cap and smaller size.

Among grass. Common.

*E. rhodopolium*.—Cap 2–5 in. across, somewhat umbonate or gibbous, then plane or depressed, brown, then pale, silky-shining, gills broad, white, then rosy ; stem 2–4 in. long, white, apex mealy, remainder smooth.

In woods. Smell strong. Fragile.

*E. majalis*.—Cap  $1\frac{1}{2}$ –3 in. across, somewhat umbonate, smooth, even ; edge wavy, cinnamon-colour, ochraceous when dry ; gills crowded, edge crenate, pallid, then rosy flesh-colour ; stem 3–4 in. long, twisted, striate, whitish, fibrillose.

Tufted, stems often growing together at the base.

In fir woods, among moss, etc.

*E. nidosum* (Pl. XVII, fig. 3).—Cap 2–3 in. across, at length often depressed and deformed, smooth, greyish fawn-colour, livid and silky-shining when dry ; gills broad, becoming distant and often wavy, pallid, then pale flesh-colour ; stem 2–3 in. long, equal, smooth, whitish.

Fragile. Smell alkaline, sometimes only weak.

In woods.

*E. speculum*.—Cap 1–2 in. across, becoming expanded and sub-depressed, edge incurved, wavy, pallid when moist, shining white when dry ; gills broad, distant, pale flesh-colour ; stem 2–3 in. long, striate, shining white.

Easily known by the shining white cap and stem when dry.

Among grass, fallen twigs, etc.

\*\* *Stem coloured*.

*E. placenta*.—Cap 1–2 in. across, soon expanded and orbicular, umbonate, even, smooth, brown ; gills crowded, white, then pale flesh-colour ; stem 2–3 in. long, entirely fibrous, fibrillose, brown.

Known by the remarkably flattened cap, depressed round the umbo, and the edge inturned.

In damp places.

*E. helodes*.—Cap 2–3 in. across, umbonate, often depressed round the umbo, smooth, livid purplish with a smoky tinge, often variegated with spots; gills adnate, rather distant, white, then flesh-colour; stem 2–3 in. long, pallid, becoming greyish and with grey fibrils.

In turfy swamps, etc. Smell of new meal.

*E. batschianum*.—Cap  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, soon umbonate, smooth, viscid, dark brown or smoky black, shining when dry; flesh same colour as the cap, white when dry; gills white, then greyish or smoky; stem 2–3 in. long, entirely fibrous, slightly fibrillose, grey.

Known by the long stem, and small discoid, dark cap.

Among grass in damp places.

*E. bloxami*.—Cap 1 in. or more across, dark dingy blue or purple, sometimes slate-colour with a tinge of lilac, inclined to be lobed at the edge; gills pale pink; stem about  $1\frac{1}{2}$  in. high, stout, coloured like the cap.

In pastures.

*E. farrahi*.—Cap rather fleshy, cylindric-ovate, then campanulate and somewhat wavy, edge often lobed, more or less umbonate, smooth, fibrillosely silky, deep indigo-blue, edge paler, about 2 in. across; gills broad, sinuate, adnexed, ventricose, somewhat distant, salmon-colour; stem ventricose, smooth, solid, coloured like the cap, base snow-white, stout, about  $2-2\frac{1}{2}$  in. long.

Closely allied to several other dark blue species of *Entoloma*, but sharply separated from each one by its smooth, elliptical spores.

This species was first observed during the visit of the Y.N.U. Fungus Foray at Helmsley.

Among short grass on lawns and in pastures. Gregarious. Odour none.

*E. ardosiacum*.—Cap 1–2 in. across, convex and usually more or less umbilicate, steel-blue with a tinge of brown, at length greyish; gills crowded, greyish flesh-colour; stem about 3 in. long, smooth, steel-blue, base white.

Size variable. Often blackish when young.

In damp meadows, also under pines.

*E. madidum*.—Cap 1–2 in. across, soon convex, smooth, often viscid when wet, shining when dry, blackish violet, sooty when old; gills almost free, soft, greyish white; stem 2–3 in. long, fibrillose, thickened in a clavate manner below, violet except the white base.

Smell pungent like that of *Russula foetens*.

Among moss, heaps of leaves, etc.

*E. jubatum*.—Cap 1–3 in. across, umbonate, fibrillose or floccosely squamulose, mouse-colour; gills nearly free, crowded, dark smoke-



colour, then pretty smoky purple ; stem 2–3 in. long, fibrous, hollow, equal, brownish, covered with smoke-coloured fibrils.

Gills becoming purplish. Stem entirely fibrous, not shining, rigid.

Among grass and moss.

*E. resutum*.—Cap about 1 in. across, brownish, never umbilicate, densely floccosely scaly, or sometimes almost even and fibrillose, brownish, disc darker ; gills rather crowded, thickish, grey from the first ; stem  $1\frac{1}{2}$ –3 in. long, entirely fibrous, polished, greyish.

In woods. Inodorous.

*E. cookei*.—Cap  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, becoming expanded, edge incurved, pale reddish orange or brick-red, everywhere covered with paler raised ribs anastomosing to form an irregular network ; gills thickish, pale flesh-colour ; stem up to 1 in. long, pale red.

On stumps.

*E. Thomsoni* (Pl. XX, fig. 4).—Cap 1–2 in. across, expanded and umbonate, grey, with an irregular network of raised ribs ; gills rather distant, flesh-colour ; stem  $1\frac{1}{2}$ –2 in. long, fibrillose and downy, paler than the cap.

Among grass under trees.

*E. tortipes*.—Cap about 3 in. across, becoming expanded and depressed round the umbo, wavy, dark brown, cinnamon when dry ; gills broadly adnate, then separating from the stem, pale, dingy pink ; stem 2– $2\frac{1}{2}$  in. long, wavy or angularly bent, silky-fibrillose, whitish tinged cinnamon.

Shining as if oiled when moist.

Among grass. Solitary.

*E. clypeatum*.—Cap 2–3 in. across, expanded and umbonate, lurid when moist, grey with darker spots or lines when dry ; gills broad, rather distant, dingy, then powdered with the reddish spores, edge serrulate ; stem 3–4 in. long, entirely fibrous, fibrillose, grey, apex powdery.

Differs from *E. tortipes* in nearly straight stem and serrulate gills.

On the ground among grass, etc.

*E. nigrocinnamomum* (Pl. XX, fig. 1).—Cap 2–3 in. across, becoming flattened and depressed round a prominent umbo, even, smooth, rather silky and shining, umber-brown, then blackish ; gills broad, reddish cinnamon ; stem about  $2\frac{1}{2}$  in. long, fibrillose, usually twisted, greyish, then tinged reddish.

Differs from *E. clypeatum* by the darker cap, hollow stem and entire edge of gills. Smell of new meal.

In pastures, etc.

*E. wynnei*.—Cap 1– $1\frac{3}{4}$  in. across, soon plane and more or less umbonate, often wavy, smoky grey, velvety, then squamulose ; gills pale salmon-colour, edge crenulate ; stem  $1\frac{1}{2}$ –2 in. long, smoky blue, base cottony, white.

Has an odour said to resemble that of bugs.

In fir woods.

*E. costatum*.—Cap 2–3 in. across, convex, then expanded, slightly umbilicate, wavy, livid brownish, grey and shining when dry; gills almost free, with prominent raised veins, pallid; stem about 2 in. long, often deformed, somewhat striate, grey, apex with white squamules.

Somewhat resembling *E. sericeum*; differing in the absence of smell, veined gills, and larger size.

In damp meadows, etc. Often tufted.

*E. sericeum*.—Cap about 1 in. across, soon expanded and minutely umbilicate, edge incurved, often wavy, brownish, then paler and shining; gills rather distant, broad, salmon-colour; stem 1–1½ in. long, fibrous, shining, colour of cap or paler.

Somewhat resembling *Nolanea pascua*; differing in the strong smell of meal, and the broad, distant gills cut out behind.

Among grass in pastures, etc.

*E. pulvereum*.—Cap campanulate, then plane, sooty, densely covered with very minute scales which are erect at the disc, ½–1 in. across; gills adnate, with a minute sinus, grey, veined, becoming deep rose-colour, exceeding the edge of the cap; stem densely velvety and powdered when young with a reddish rust-coloured meal, 1–2 in. long (spores angular, 12–13 × 6μ).

Easily known by the mealy stem and squamulose cap. Allied to *E. griseocyaneum*.

Among oak leaves on the ground.

*E. griseocyaneum*.—Cap up to 1 in. across, entirely floccosely squamulose, grey or with a lilac tinge; gills becoming free, white, then flesh-colour; stem 1½ in. long, floccosely fibrillose, pallid, then bluish, at length entirely white.

Stem at first coloured, then white, hence should be included in both sections of the genus. Resembling a *Leptonia* superficially, differing in being entirely soft and not cartilaginous.

In sunny pastures.

#### NOLANEA

Cap regular, thin, campanulate, more or less papillate, striate, or even and flocculose, edge at first straight and pressed to the stem; gills adnexed or free, never decurrent; stem central, cartilaginous; spore with a pink or salmon-coloured tinge.

Most nearly allied to *Leptonia*, differing in the edge of the cap being straight, and not incurved when young, and in the usually papillate cap.

\* *Gills with a grey or fuscous tinge; cap dark coloured, hygrophaneous.*

*N. pascua* (Pl. XIX, fig. 2).—Cap thin, conical, then more or less expanded, smooth, hygrophaneous, livid bistre, silky and shining



when dry,  $\frac{2}{3}$ –1 in. across ; gills almost free, rather crowded, edge eroded or uneven, salmon-colour ; stem hollow, silky fibrous, fragile, shining, slender, pale.

Inodorous. A variable fungus. Cap sometimes sooty, and more or less fibrillose, and stem similar in colour, gills greyish pink. The distinctly fibrous stem separates this from every other species of *Nolanea*. Commonly confounded with *Entoloma sericeum*, which differs in the strong, mealy smell, and the broad, distant gills, cut out behind.

In pastures, etc. Very common.

*N. babingtonii*.—Cap thin, conico-campanulate, pale grey with a silky sheen, disc rather squamulose, remainder with dark brown fibrils, about  $\frac{1}{2}$  in. across ; gills adnate, distant, grey ; stem about 1 in. long, hollow, slightly wavy, covered with brown down.

On the ground.

*N. araneosa*.—Cap conico-campanulate, grey, fibrillosely silky ; stem slender, hollow, grey, with traces of the grey veil ; gills greyish brown.

In pine woods.

*N. versatilis*.—Cap thin, convex, then expanded, smooth, even, shining, livid verdigris-colour, brownish when dry ; stem hollow, smooth, greyish white, silvery shining when dry ; gills slightly adnexed, ventricose, distant, grey.

Remarkable for the metallic tints shown by the cap under different aspects of light. Stem 2–2 $\frac{1}{2}$  in. long. Gills very broad in front.

On naked ground in woods.

*N. papillata*.—Cap thin, subcampanulate, then expanded, papillate, striate, brownish bay, cinnamon when dry, about 1 in. across ; gills rather crowded, sinuato-adnate ; stem smooth, shining, with white meal at the apex, downy at the base, 1 $\frac{1}{2}$ –2 in. long.

On the ground.

*N. rhodospora*.—Cap convex, 1 in. across, sooty or rufescent-pilose ; gills sinuate or free, salmon or rose ; stem sub-bulbous, white.

On earth and wooden labels in a stove.

*N. mammosa*.—Cap thin, conico-campanulate, acutely umbonate or papillate, slightly striate, smooth, pale brown, pale ochre and silky when dry,  $\frac{1}{2}$ –1 in. across ; gills crowded, greyish, then with a pink tinge ; stem about 2 in. long, smooth, shining, fragile, thinner downwards, hollow, apex powdered with white meal.

Among short grass in open, sunny places.

*M. juncea*.—Cap thin, conical, then expanded, striate, sooty umber, disc slightly umbilicate or papillate or umbonate, slightly squamulose, about  $\frac{2}{3}$  in. across ; gills grey, then purple-brown ; stem 2–3 in. long, equal, brown.

In swamps among *Sphagnum*, in woods.

*N. fulvo-strigosa*.—Cap conico-campanulate, subumbonate, wrinkled, ochraceous with an olive tinge when dry, up to 1 in. across; gills rather distant, greyish, with a flesh-coloured tinge; stem about 2 in. long, clad with mealy squamules, densely strigose with reddish fibrils at the base.

On the ground.

\*\* *Gills becoming yellowish or reddish.*

*N. pisciodora*.—Smell strong, resembling stinking fish. Cap conico-campanulate, then expanded, slightly umbonate, minutely velvety to the touch, tawny-cinnamon; gills yellowish, then pink, finally with a tawny tinge; stem chestnut or blackish, paler and minutely velvety upwards, 2–3 in. long.

Among leaves in woods.

*N. nigripes* (Pl. XXIV, fig. 7).—Cap thin, rather tough, campanulate, smooth, brown, covered with yellowish flocculent particles about  $1\frac{1}{2}$  in. across; gills rather crowded, yellowish, then flesh-colour; stem 4–5 in. long, twisted, rather wavy, smooth, black.

Smell resembling stinking fish.

In swampy places.

*N. rufo-carnea*.—Cap thin, hemispherical, umbilicate, slightly fibrillose, reddish brown, up to 1 in. across; gills pale salmon-colour; stem about 2 in. long, pale reddish brown, paler above, hollow.

On heaths, etc.

*N. icterina*.—Cap  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across, thin, campanulate, soon convex, often wavy, pellucidly striate, yellowish green, rarely honey-colour, pale and silky when dry, disc sometimes obtuse, at others papillate, often brown and with brown squamules; gills adnexed, distant, pallid; stem 1–2 in. long, colour of the cap, or brown.

Very variable. Usually somewhat caespitose.

Among grass, also on cultivated ground.

*N. subglobosa*.—Cap about  $\frac{2}{3}$  in. across, even, hemispherical, rather viscid, yellowish; gills nearly free, broad, rhomboid, convex, flesh-colour with a yellowish tinge; stem about  $1\frac{1}{2}$  in. long, longitudinally striate, pale.

Distinguished by the subglobose, viscid, yellow cap and broad gills.

On the ground.

\*\*\* *Gills white, then rosy. Cap hygrophaneous.*

*N. picea*.—Cap up to  $1\frac{1}{2}$  in. across, conical, then campanulate, at length expanded, papillate, even, smooth, black, edge paler, umber when dry; gills rather distant, pale, then flesh-colour; stem 1–2 in. long, pitch-black, not straight, hollow.

Smell strong, resembling cucumber or decaying fish. Allied to *N. pisciodora*, differing in the smooth, pitch-black cap and stem when moist.

Among grass.



*N. infula*.—Remarkably tough. Cap thin, conical, then expanded, papillate, dark grey, buff when dry, up to  $\frac{3}{4}$  in. across ; gills crowded, snow-white, then pink ; stem about 2 in. long, smooth, brown.

Inodorous. Gills often breaking away and becoming free.

On the ground in copses, etc.

var. *versiformis*.—Cap convex, then depressed or even infundibuliform, but persistently papillate, densely but slightly striate, silky when dry.

On the ground.

*N. caelestina*.—Cap up to  $\frac{3}{4}$  in. across, thin, campanulate, obtuse or slightly umbonate, smooth, striate, pale blue, disc darker and rough ; gills rather crowded, white, then tinged pink ; stem 1–1 $\frac{1}{2}$  in. long, dark blue, apex mealy, hollow.

Solitary. Inodorous. Coloured like a *Leptonia*.

In pine woods, on wood, etc.

*N. exilis*.—Cap up to  $\frac{2}{3}$  in. across, thin, conical, then expanded, striate, smooth, livid grey, papillose disc darker ; gills rather crowded, whitish, then tinged pink ; stem 2–3 in. long, greyish green.

Allied to *N. chloropolia*, but more slender and delicate. Cap varying to lilac.

Among grass, leaves, etc.

*N. verecunda*.—Cap about  $\frac{1}{2}$  in. across, thin, at first somewhat umbonate, then blunt, watery reddish or pallid, edge flocculose ; gills adnate, then seceding from the stem, distant, whitish ; stem 1 $\frac{1}{2}$ –2 in. long, becoming pale, apex mealy.

Among grass.

\*\*\*\* *Gills whitish. Cap not hygrophanous.*

*N. rubida*.—Cap about  $\frac{1}{3}$  in. across, thin, convex, at length expanded and umbilicate, minutely silky, even, whitish grey, then rufescent ; gills adnate, narrowed behind, ventricose, sometimes slightly decurrent, whitish, then salmon-colour ; stem about  $\frac{1}{4}$  in. long, thickest upwards, white, solid.

Known by its small size, and by the white cap becoming rufescent with age, or on drying.

Smell resembling meal.

On soil in a hot-house.

#### LEPTONIA

Cap regular, thin, usually umbilicate and broken up into scales or fibrils, edge incurved when young ; gills adnate or adnexed ; stem central, more or less polished.

Mostly growing on the ground, in pastures or swampy places, rarely on wood. Differs from *Nolanea* in the edge of the cap being incurved when young, and in the umbilicate cap.

\*\* *Not hygrophanous* ; gills whitish.

*L. placida*.—Cap 1–1 $\frac{3}{4}$  in. broad, thin, campanulate, then convex, not striate, the blackish disc downy, the remainder with blackish squamules on a paler ground-colour ; gills very broad behind, crowded, whitish ; stem 2–3 in. long, smooth, even, blackish blue, apex with white meal and blackish points.

*Leptonia lappula* also has black points at the apex of the stem, but differs in the umbilicate cap.

On or near beech trunks.

*L. lappula*.—Cap rather fleshy, convex, then plane, not striate, flocculose when young, then with crowded, short, erect fibrils, grey, often with a brown tinge, about 1 $\frac{1}{2}$  in. across ; gills crowded, whitish, then dingy salmon-colour ; stem about 2 in. long, brownish lilac, apex naked and with blackish points ; the stem is sometimes blackish purple.

Stem distinctly and widely hollow.

Among beech leaves, etc.

*Leptonia reae*.—Cap up to  $\frac{1}{2}$  in. broad, becoming expanded, even, smooth, deep blue with purple tinge, edge slightly incurved at first ; stem 1–1 $\frac{1}{2}$  in. long, wavy, blue-black, then often vinous ; gills short, broad, broadly and deeply sinuate, narrowly adnate, then free, whitish, then greyish pink.

In pastures.

*L. lampropoda* (Pl. XVII, fig. 1).—Cap thin, convex, then expanded, obtuse, becoming depressed, almost smooth, then squamulose, mouse-grey or sooty grey with a violet tinge, then paler, about 1 in. across ; gills adnate, whitish, then rosy ; stem 1–1 $\frac{1}{2}$  in. long, smooth, bluish violet.

Resembling *L. asprella*, differing in the stout stem, and absence of striæ and of an umbilicus.

Among grass in pastures, heaths, etc.

*L. æthiops*.—Cap thin, plane, then depressed, fibrillosely streaked, smooth, shining, sooty black, 1–1 $\frac{1}{2}$  in. across ; gills adnexed or adnate, whitish ; stem 1 $\frac{1}{2}$ –2 in. long, slender, smooth, blackish brown, with black points near the top.

Differs from *L. lampropoda* by the slender stem with black points at the top, and from *L. serrulata* by the cap not being umbilicate.

Among grass, etc.

\*\* *Gills bluish*.

*L. serrulata*.—Cap thin, convex, umbilicato-depressed, squamulose, blackish-blue, smoke colour when old, shining when dry, about 1 in. across ; gills adnate, greyish white, edge serrulate, at length greyish flesh-colour ; stem about 1 in. long, smooth, paler than the cap, apex with black points.

Rigid. Stem black or steel-blue, glaucous.

Among grass, etc.



*L. euchroa*.—Cap rather fleshy, convex, obtuse, squamulosely fibrillose, violet, then smoky purple, about  $\frac{3}{4}$  in. across; gills adnate, dark violet, then paler, the edge remaining dark; stem about  $1\frac{1}{2}$  in. long, smooth, dark violet.

Solitary or gregarious. Known from *L. chalybea* and *L. lazulina* by growing on wood.

On trunks and branches of hazel, etc.

*L. chalybea*.—Cap thin, convex, somewhat umbonate, flocculose, then squamulose, dark violet or blackish blue, about 1 in. across; gills adnate, crowded, greyish white; stem about 1 in. long, smooth, steel-blue.

In colour almost resembling *L. lampropoda*, but different in structure, and the stem much more slender. Differs from *L. lazulina* by the cap not being striate, and from *L. euchroa* by growing on the ground.

Among grass, etc.

*L. lazulina*.—Cap thin, campanulate, then expanded, striate, smooth, then becoming more expanded, slightly umbilicate, squamulose, blackish smoke-colour, at first often blackish blue or greyish bay, the disc darker, about  $\frac{2}{3}$  in. cross; gills adnate, crowded, pale blue; stem about 2 in. long, hollow, smooth, deep blue.

Gregarious, fragile, about the size of *L. asprella*.

Among grass, etc.

\*\*\* *Gills pallid*.

*Leptonia incana*.—Cap thin, fragile, convex, then expanded, umbilicate, striate, even, variegated green and brown, silky and greyish when dry, about 1 in. across; gills adnate, broad, distant, greenish white, then flesh-colour; stem 1–2 in. long, smooth, greenish or brownish green.

Gregarious. Cap brown, variegated with green.

Among grass, moss, etc.

*L. chloropolia* (Pl. XV, fig. 6).—Cap thin, convex, then expanded, striate, livid or yellowish green, the disc with black squamules, up to 1 in. across; stem 2–3 in. long, even, smooth, greyish green, hollow; gills narrowed behind and adnate, pallid, then with a tinge of salmon-colour.

Somewhat resembling *Nolanea exilis*, but more robust. Differing in colour from *L. formosa*.

Among grass in woods, etc.

*L. formosa*.—Cap thin, rather tough, convex, then plane, umbilicate, striate, waxy yellow, more or less covered with minute, darker squamules, about 1 in. across; gills adnate, rather distant, pale yellow, then flesh-colour; stem about 2 in. long, equal, smooth, shining, yellow.

Closely allied to *L. asprella*. The stem is sometimes brownish or bluish.

In woods, especially pine.

var. *suavis*.—Cap  $1\frac{1}{2}$ –2 in. across, convex, then expanded, umbilicate, fawn-colour, stem 3–4 in. long, equal, pale greyish blue ; gills broad, adnate, salmon-colour.

It is doubtful whether the type form has been met with in this country. The variety *suavis* has once been collected in a *Sphagnum* swamp, on Seamer Moor, near Scarborough.

\*\*\* Gills grey or glaucous.

*L. asprella*.—Cap thin, convex, then expanded, umbilicate, centre downy, then squamulose, the remainder sometimes smooth, sometimes fibrillose, hygrophanous, at first smoke-colour or mouse-colour, then livid grey,  $1$ – $1\frac{1}{2}$  in. across ; gills adnate, then separating and becoming free, rather distant, gradually narrowed from the stem to the edge, greyish white ; stem  $1$ – $2$  in. long, slender, smooth, hollow, livid, fuscous, green and blue mingled, base with white down.

A variable species. The cap sometimes squamulose everywhere. Some forms resemble a *Nolanea*, cap hemispherical, then campanulate, disc sometimes with a minute depression, sometimes with a papilla.

Among grass.

*L. nefrens*.—Cap thin, convex, then plane, at length infundibuliform, hygrophanous, not striate, slightly squamulose, often rather wavy, livid sooty, centre darkest, pale livid when dry,  $1$ – $2$  in. across ; gills adnexed, but soon separating from the stem, broad, crowded, pale grey, edge blackish ; stem  $1$ – $1\frac{1}{2}$  in. long, smooth, hollow, livid brown.

Allied to *L. serrulata*, but distinguished by the quite entire edge of the gills, and the absence of black points at the apex of the stem.

In damp places among moss, etc.

#### CLITOPILUS

Cap regular or excentric, edge at first incurved ; gills more or less decurrent ; stem fleshy or fibrous, not cartilaginous externally, central.

Differs from *Eccilia* in the fibrous stem, and from *Entoloma* in the decurrent gills.

1. Gills deeply decurrent ; cap excentric or wavy.

*C. prunulus* (Pl. XVII, fig. 2).—Cap 2–4 in. across, fleshy, wavy or unequal, white, rarely tinged grey ; gills slightly crowded, becoming flesh-colour ; stem 1 in. or more long, stout, smooth, white.

Smell pleasant, resembling new meal. Edible.

In woods, etc.



*C. orcella*.—Cap up to 3 in. across, thin, waved and lobed, white, with a yellowish tinge; gills crowded; stem under 1 in. long, thickened upwards, slightly flocculose, white.

Differs from *C. prunulus* in smaller size, thinner cap and flocculose stem.

In open places among grass, etc.

*C. mundulus*.—Cap 1–2 in. across, somewhat gibbous when young, minutely flocculose, wavy, pallid white; gills narrow, thin; stem about 1 in. long, floccosely downy, then smooth, white.

Cap white, then grey spotted, finally blackish.

In woods among fallen leaves, etc.

*C. cretatus*.—Cap  $\frac{1}{4}$ – $\frac{3}{4}$  in. across, convex, then umbilicate, white shining; gills very decurrent, pale pink; stem a few lines high, slender, downy, white.

On naked soil in woods and pastures.

*C. popinalis*.—Cap 1–2 in. across, thin, wavy, grey, spotted and marbled; gills very decurrent, dark grey, then reddish; stem 1–2 in. long, often wavy, paler than the cap.

Smell like new meal. Entirely grey.

Among grass, etc.

*C. sarnicus*.—Cap campanulate, then expanded, umbonate and usually more or less depressed round the umbo, slightly pellucidly striate when moist, even when dry, minutely silkily floccose, grey or mouse-colour, paler and with a ruddy tinge when dry, up to  $1\frac{1}{2}$  in. across; gills somewhat crowded, plane nearly up to the stem, then suddenly decurrent, pinkish salmon; stem equal, minutely fistulose, equal, very slightly wavy, even, smooth, white,  $1$ – $1\frac{1}{2}$  in. long.

Recognized at once by the very peculiar shape of the gills. Differs from *C. undatus* in the absence of a grey tinge on the gills. Only known from Guernsey.

On the ground among grass.

*C. undatus*.—Cap  $1$ – $1\frac{1}{2}$  in. across, wavy, sooty grey with a brown tinge, then pale; gills dark grey with a pink tinge; stem about 1 in. long, colour of cap

Among grass.

*C. cancrinus*.—Cap about 1 in. across, soon plane and deformed, pallid tan or white; gills white, then flesh-colour; stem scarcely 1 in. long, smooth, white.

Among grass, etc.

2. *Gills adnate, slightly decurrent; cap regular.*

*C. carneoalbus*.—Cap up to 1 in. across, centre depressed, edge drooping, polished, white, disc tinged rufous; gills crowded, salmon-colour; stem  $1$ – $1\frac{1}{2}$  in. long, white.

On heaths, etc. Inodorous. Gregarious.

*C. vilis*.—Cap about 1 in. across, umbilicate, grey, silky-fibrillose ; gills almost triangular, crowded, whitish ; stem 2–3 in. long, rather rough, colour of cap.

Resembles a *Leptonia* in the umbilicate cap, differing in the decurrent gills.

Among grass, moss, etc., in open places.

*C. angustus*.—Cap thin, soon expanded until almost plane, slightly umbonate or sometimes obtuse, margin remaining more or less arched for a considerable time, smooth, even, grey with a tinge of green, silky-shining, 1–2 in. across ; gills adnato-decurrent, somewhat crowded, rather narrow, for a long time pallid, at length becoming tinged flesh-colour ; stem rather stout, almost equal, stuffed, even, smooth, white, base more or less strigose when growing amongst damp leaves, 3–4 in. long (spores tinged pink, slightly nodulose,  $7-8 \times 5 \mu$ ).

Very distinct in build and colour from any of our other species of *Clitopilus*, and superficially closely resembling *Entoloma prunuloides*, from which it is distinguished by the decurrent gills. First British specimens found in Mulgrave Woods, during the Y.N.U. Fungus Foray, September, 1910.

On the ground in woods, among dead leaves, etc.

*C. straminipes*.—Cap 1–2 in. across, smooth, even, whitish, becoming expanded and depressed ; gills shortly decurrent, whitish, then rosy ; stem about 2 in. long, smooth, straw-colour below, sprinkled with white meal above.

Known by the white, shining cap and straw-coloured stem.

Among grass.

*C. stilbocephalus*.—Cap  $\frac{2}{3}$ –1½ in. across, sometimes slightly umbonate, yellowish white or greyish, sparkling with atoms, white when dry ; gills adnate or adnexed, veined, salmon-colour ; stem 2–3 in. long, silky-fibrous, white.

Distinguished by the cap being covered with glistening particles. Not a typical *Clitopilus*.

On the ground.

*C. smithii*.—Cap  $\frac{2}{3}$ –1½ in. broad, soon plane, sometimes wavy, even, white, or with a yellow tinge, atomate ; gills broadly adnate, with a decurrent tooth, salmon-colour, stem 2–3 in. long, pallid with a reddish tinge below, surface undulated.

Differs from *C. stilbocephalus* in the plane cap and tinted stem.

On the ground.

### ECCILIA

Cap regular, thin, at first umbilicate, then often funnel-shaped ; gills truly decurrent ; stem central, cartilaginous externally.

Allied to *Clitopilus* in the decurrent gills, differing in the cartilaginous or polished, and not fibrous stem.



*E. parkensis*.—Cap about  $\frac{3}{4}$  in. across, deeply umbilicate, smooth, striate, brown when moist, blackish when dry ; gills crowded, becoming flesh-colour ; stem about  $\frac{3}{4}$  in. long, smooth, brown.

Among grass.

*E. carneogrisea*.—Cap  $\frac{2}{3}$ –1 in. across, umbilicate, finely striate, greyish flesh-colour ; gills with the edge irregular and darker ; stem  $1\frac{1}{2}$ –2 in. long, polished, colour of the cap.

Among fir leaves, etc. Gregarious. Shining.

*E. griseorubella*.—Cap about 1 in. across, deeply umbilicate, at length plane, striate, umber, hoary when dry ; gills rather broad, slightly decurrent ; stem  $1\frac{1}{2}$ –2 in. long, smooth, paler than the cap.

On the ground in pine woods, etc.

*E. rhodocylix*.—Cap about  $\frac{1}{2}$  in. across, umbilicate or infundibuliform, brown, grey and minutely flocculose when dry ; gills very distant, broad ; stem up to 1 in. long, smooth, grey.

Known by the very distant gills and its habitat.

On rotten trunks, etc.

*E. atropuncta* (Pl. XV, fig. 3).—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, slightly umbilicate, smooth, grey ; gills greyish flesh-colour ; stem about  $1\frac{1}{2}$  in. long, pallid, shining, sprinkled with black, dot-like squamules.

On the ground among moss, etc., in woods.

*E. atrides*.—Cap submembranaceous, soon plane, deeply umbilicate, striate, black or brown, becoming pale, virgate or finely streaked with black lines ; gills deeply decurrent, narrowed behind, rather crowded, pallid, edge black and minutely toothed ; stem hollow, pallid upwards and dotted with black points.

A small fungus, respecting which more information is desirable, as it has not been observed for many years. It has been suggested that it may be a modified condition of *Leptonia serrulata*.

In moist woods.

*E. nigrella*.—Small, somewhat tufted, cap smooth, umbilicate, becoming blackish, but not punctate with black ; gills flesh-colour, then somewhat grey, edge the same colour ; stem short, glaucous. Near to *E. atrides*, differing in the stem not being spotted with black near the apex, and in the edge of the gills not being toothed with black points.

In pastures.

*E. flosculus*.—Cap about  $\frac{2}{3}$  in. across, thin, deeply umbilicate, somewhat irregular, blackish brown, becoming whitish with age, pruinose with crystalline particles ; gills decurrent, somewhat waved, thick, pink ; stem about  $\frac{3}{4}$  in. long, narrowed downwards, reddish, pruinose or innately fibrillose.

On the ground at the foot of, and on the stems of tree ferns. Probably an introduced species.

*E. acus*.—Cap up to  $\frac{1}{2}$  in. across, thin, deeply umbilicate, edge striate and incurved, white, densely pruinose ; gills thick, distant,

deeply decurrent, pink ; stem about 1 in. long, thin, smooth, whitish.

Differing in its snow-white, pruinose cap from all other known species.

Among cocoanut fibre. Probably an introduced species.

### CLAUDOPUS

Cap excentric, lateral or resupinate ; stem very short or entirely absent ; gills sinuate or decurrent.

Minute fungi known by the excentric or resupinate cap and rudimentary or obsolete stem. When young the gills are whitish, and are then liable to be confounded with the minute kinds of *Pleurotus*.

*C. variabilis* (Pl. XVII, fig. 5).—Cap  $\frac{1}{4}$ – $\frac{2}{3}$  in. across, resupinate or fixed by the cap, gills uppermost, then more or less turned over, and often with a very short, stem-like base, edge incurved, silky with white down, very thin, often wavy ; gills radiating from the point of attachment, white, then pale salmon-colour.

On dead wood, branches, etc.

*C. depluens*.—Cap up to  $\frac{1}{2}$  in. across, edge incurved, whitish or tinged red, hoary ; stem lateral, short, or absent ; gills broad, crowded, grey, then reddish.

Very variable, sometimes with a central stem.

On the ground, usually attached to moss.

*C. byssisedus*.—Cap up to  $\frac{3}{4}$  in. across, resupinate, then horizontal, reniform or kidney-shaped, edge incurved, downy, grey, becoming pale ; stem lateral, very short ; gills grey with a pink tinge.

Known by the grey cap. Resembles *Pleurotus applicatus*, differing in the stem and pink gills.

On rotten wood and on the ground.

### Sub-Family OCHROSPOREÆ

This group contains a large assemblage of genera, linked together by the general colour of the spores, which ranges from pale, dingy ochraceous, through bright ochraceous to deep rusty orange. Negatively defined, the spores are never white, salmon-colour, black nor purplish black. As in the previous groups, the genera range from species furnished with a volva or a ring, free, adnate, and decurrent gills, etc., cap with a central stem, through genera where volva and ring are both absent, and in the most reduced forms, to where the stem has disappeared, and the reduced cap is attached to the matrix, having the gills uppermost.

Many of the species are large and brightly coloured.



## KEY TO THE GENERA

A. *Gills separating very easily from the flesh of the cap.*

Edge of cap persistently incurved; gills decurrent or adnato-decurrent. *Paxillus.*

B. *Gills not separating readily from the flesh of the cap.*

\* *Stem furnished with a volva, or with a well-formed interwoven ring.*

Volva present; ring absent. *Acetabularia.*

Volva absent; ring present. *Pholiota.*

\*\* *Volva and ring both absent.*

† *Stem central.*

Gills free. *Pluteolus.*

Cap membranaceous; gills deliquescent at maturity. Entire fungus ephemeral. *Bolbitius.*

Stem fleshy, fibrous externally; cap fibrillose or scaly; gills sinuato-adnexed. *Inocybe.*

Stem fleshy, fibrous externally; cap smooth, viscid; gills sinuato-adnexed. *Hebeloma.*

Stem cartilaginous externally; edge of cap incurved at first; gills adnexed or adnate. *Naucoria.*

Stem cartilaginous externally; edge of cap straight at first; gills adnexed or adnate, often with a decurrent tooth. *Galera.*

Stem cartilaginous externally; gills broadest behind, decurrent or adnato-decurrent. *Tubaria.*

Stem fibrous externally, fleshy; gills adnate or decurrent.

*Flammula.*

Universal veil cobweb-like, not forming an interwoven ring, often collapsing and forming one or more ring-like zones on the stem; stem fibrous, fleshy. *Cortinarius.*

†† *Stem excentric, or absent.*

*Crepidotus.*

## NOTES ON THE GENERA

## PAXILLUS

The most dominant feature of the present genus is the ease with which the gills separate from the flesh of the cap when slightly rubbed, and in many instances the separation takes place spontaneously when the fungus is old. The next point of importance is the persistently incurved edge of the cap. The edge of the cap is incurved during the early stage in a great many other fungi, but it straightens out as the cap expands. There is a considerable range of relative development in the different species. The stem may be central, excentric, lateral or entirely absent. The gills are always more or less decurrent, sometimes deeply so. Some of the species are quite large, others small.

The counterpart, structurally, of this genus is *Clitocybe*, in the *Leucosporeæ*.

## ACETABULARIA

The single species constituting this genus has only been met with once, about a century ago. It was described and figured by Sowerby, one of the pioneers in British mycology, and is retained in the hope that someone may succeed in finding it again. It has been suggested that it should be omitted from the list of British fungi, as being something spurious. This, however, in the light of other fungi described many years ago by Bolton, another pioneer in the study of fungi, being considered as doubtful, have recently been rediscovered, and the original description and figures proved to be correct, by Mr. C. Crossland of Halifax.

## PHOLIOTA

This genus includes some of our most beautiful species of fungi, the colour ranging from deep orange to clear, bright yellow, and often furnished on the cap and stem with large scales, which always adds so much to the appearance of a fungus. The ring on the stem is constantly present, and in most instances is well interwoven or compact, and persistent. In *Flammula*, a closely related genus, the ring, if present, is only loosely fibrillose, and never forms more than a silky zone round the stem of the mature fungus. In *Cortinarius*, again, the secondary veil is only cobweb-like, and never forms a membranous ring.

*Pholiota* agrees in structure with *Armillaria* in the Leucosporeæ, and with *Stropharia* in the Melanosporeæ.

## PLUTEOLUS

The two species included in this genus are easily recognized by the perfectly free gills and thin, viscid cap.

Corresponds with *Schulzeria* in the Leucosporeæ, *Chlorospora* in the Chlorosporeæ, and with *Pluteus* in the Rhodosporeæ.

## BOLBITIUS

A very remarkable genus, approaching *Coprinus* in the early deliquescence of the gills. All the species are slender, and disappear very quickly. Clear yellow to bright orange are the predominating colours.

## INOCYBE

A very large genus, the species of which cannot be identified with certainty, without microscopic examination, on account of a general superficial resemblance between what are in reality very distinct species. The characters of most importance in the correct discrimination of species are the spores, whether warted or smooth, and the presence or absence of cystidia in the gills. Bright colours are absent, dingy brown being the predominating tint. Some



species have the cap and stem bristling with erect scales, but in the majority the cap is coarsely fibrillose, sometimes silky.

Most species are small ; all grow on the ground, mostly in woods. None are edible.

#### HEBELOMA

Medium-sized fungi, growing on the ground in woods. The colours are for the most part dingy ; several species have a very unpleasant smell. The genus is closely allied to *Inocybe*, differing more especially in the cuticle of the cap being more or less viscid and never coarsely fibrillose or broken up into scales.

*Hebeloma* agrees in structure with *Tricholoma* in the Leucosporeæ, with *Entoloma* in the Rhodosporeæ, and with *Hypholoma* in the Melanosporeæ.

#### NAUCORIA

The species are mostly small, and usually of a brownish colour, growing on the ground among grass, moss, etc. The species are very variable amongst themselves, but all agree in the following features. Spores ferruginous ; stem cartilaginous ; edge of the cap incurved when young. The last character distinguishes the present genus from *Galera*, in which the edge of the cap is straight when young.

*Naucoria* agrees in structure with *Collybia* amongst the Leucosporeæ, and with *Leptonia* in the Rhodosporeæ.

#### GALERA

Generally small, slender, fragile fungi, growing on the ground. Cap campanulate at first, and often remaining permanently so, smooth ; stem elongated and slender, hollow. Corresponding in structure to *Mycena* in the Leucosporeæ, and to *Nolanea* in the Rhodosporeæ.

#### TUBARIA

Small fungi, characterized by having decurrent gills and a cartilaginous stem. The only other genus having decurrent gills in the Ochrosporeæ is *Flammula*, which differs in having the stem fibrous externally. In some species the gills are obviously decurrent, in others only very slightly so, being, technically, broadly adnate, with a decurrent tooth. The colour is usually yellowish brown. Some species grow on chips, fallen branches, etc., others are only met with in swamps among *Sphagnum*, etc.

#### FLAMMULA

A large genus, containing many showy species, yellow and orange being the prevailing colours. In some species the cap is viscid or glutinous, and scaly, as is also the stem up to the ring-zone. The characters of the genus are not all that could be desired, and are much in need of a thorough revision, after careful study, both in the field and at home, aided by a microscope. As at present constituted, the gills are adnate in some species, decurrent in others.

Several of the larger species grow on wood, and some are destructive parasites on forest trees.

Very closely allied to *Pholiota*, differing mostly in the imperfectly formed ring.

#### CORTINARIUS

One of the most natural of genera included in the Agaricaceæ, and at the same time, perhaps the most difficult genus to define. The most marked, and constant combination of characters are the cobweb-like secondary veil, which never forms a definite, interwoven ring round the stem, but when collapsed, forms one or more white or coloured zones round the stem. The veil can be best seen when the cap is just commencing to expand, when the veil stretches in exceedingly fine, cobweb-like threads from the stem to the edge of the cap. The second constant character is the bright rusty or ferruginous spores.

Very many of the species are large fungi, with a fleshy, usually convex cap, which may be viscid or even sufficiently glutinous for the gluten to run off in drops. The cap is generally smooth and even, no truly striate cap being present in the genus. The cap in a few instances is covered with very minute, fibrillose fibres. The stem is fairly stout, always central, and in one section is viscid or glutinous, like the cap. The gills are dry, and usually become powdered with the rusty spores. The colours are often bright and clear, such as some of the pure amethyst and blue species; others are blood-red throughout. Green-coloured species are also in evidence. In very many species there is a violet or lilac tint present on the cap, gills, or stem, which is very evident when the plant is moist and growing, but which disappears entirely when the plant is dry. This feature must be carefully noted at once, as it is a point of importance in the discrimination of species, and it often disappears before the plants reach home, and certainly will not be present on the following day. In all known species the cap is regular, and the stem central; no oblique, sessile, or resupinate species being known from any part of the world.

The genus *Cortinarius* requires to be carefully studied in the field and in the laboratory; anyone with a taste for specializing would find ample return for time spent on this, the largest genus included in the Agaricaceæ.

All the species grow on the ground, mostly in mixed woods. The majority appear late in the season, and come up under the fallen leaves, and are thus apt to be overlooked. None of the species are included in the list of edible fungi in this country.

#### CREPIDOTUS

A genus characterized by the resupinate, sessile, or excentrically stemmed cap. Several of the species are very minute. In some



forms there is a gelatinous upper layer present in the substance of the cap. Care must be taken not to confound the species with similar small species of *Claudopus*, in which the spores are salmon-colour and not rusty or cinnamon-colour.

### PAXILLUS

Cap symmetrical or excentric, edge persistently incurved; gills decurrent, separating readily from the flesh of the cap; stem central, excentric or lateral.

Readily known by the persistently incurved edge of the cap, and the decurrent gills that can be easily removed from the flesh of the cap.

*P. lepista*.—Cap 2–5 in. across, soon plane or depressed, edge strongly involute, dingy white; gills very narrow, crowded, decurrent, white, then pale buff; stem 2–4 in. long, solid, dingy white.

Distinguished from the large white species of *Clitocybe* by the strongly incurved edge of the cap, and by the gills being easily rubbed away from the flesh of the cap.

On the ground, usually in woods.

*P. extenuatus*.—Cap  $1\frac{1}{2}$ – $3\frac{1}{2}$  in. across, rigid, becoming plane, smooth, brownish tan or yellowish tan, edge incurved, downy; gills crowded, white, then mouse-colour; stem  $1\frac{1}{2}$ –2 in. long, fibrous, pallid, ending in a tuberous rooting base.

Grassy places in fir woods, etc.

*P. panæolus*.—Cap 1–2 in. across, becoming plane or depressed, whitish, edge thin, incurved; gills crowded, at length tinged rust-colour; stem  $1$ – $1\frac{1}{2}$  in. long, rufescent.

Smaller and more slender than *P. extenuatus*; flesh becoming blackish.

On the ground in pine woods.

*P. paradoxus*.—Cap 1–3 in. across, rufous umber, densely downy, often with a purple tinge; gills pale, then deep yellow, decurrent, distant; stem up to 1 in. long, fibrillose, yellow.

Known by the dark, velvety cap and bright yellow gills.

On the ground, often on banks, etc.

*P. involutus* (Pl. XXVI, fig. 6).—Cap 3–6 in. across, plane, then depressed, almost smooth, tawny ochre, the strongly incurved edge downy; gills decurrent, branched, joining to form pores near the stem, dingy ochre, darker when bruised; stem 1–2 in. long, paler than the cap.

On the ground. Common.

*P. leptopus*.—Closely resembling *P. involutus*; differing in the stem being excentric or lateral, and very short.

On the ground or on stumps.

*P. atrotomentosus*.—Cap 3–5 in. across, becoming depressed,

rust-colour ; gills yellowish tawny ; stem about 1 in. long, blackish umber and densely velvety, rooting.

In pine woods on trunks and on the ground.

*P. alexandri*.—Cap fleshy, compact, soon plane, then depressed, edge strongly involute, dry unpolished, fawn-colour or dingy yellowish white, 2–3 in. across ; gills decurrent, crowded, narrow, honey-colour ; stem up to 1 in. long, stout, solid, whitish.

Very hard and compact. Almost exactly resembling a small form of *Lactarius vellereus* in habit and general appearance, as seen from above, but differing in the honey-coloured gills. Allied to *P. involutus*.

On the ground in woods.

*P. orcelloides*.—Cap thin, convex, then flattened, but with the edge persistently incurved, minutely silky, shining, snow-white at first, becoming stained with greyish blotches, 1–1½ in. across ; gills adnato-decurrent, crowded, whitish, then livid, at length yellowish brown, separated from the flesh of the cap by a horny line ; stem 1½–2 in. long, tapering downwards, elastic, silky-fibrillose, solid, ochraceous.

Allied to *Paxillus panæolus*, but rather larger, and the stem gradually tapering from the apex to the base.

Among grass under trees, etc.

*P. lividus*.—Cap convex, then slightly depressed at the disc, margin slightly arched and incurved, dingy white or livid ochraceous, opaque, 1–2 in. across ; gills decurrent, arcuate, almost crowded, white ; stem 3–4 in. long, narrowed downwards, fibrillose, white, usually slightly wavy.

Closely allied to *P. revolutus*, but distinguished by the absence of any tinge of violet on the cap or stem, and by the persistently white gills.

On the ground in woods. Usually growing in small clusters.

*P. revolutus*.—Cap 1–1½ in. across, convex, obtuse, pale ochraceous, slightly darker at the disc, edge thin, even, sometimes at first tinged with violet, becoming a little upturned ; gills deeply decurrent, scarcely crowded, pallid, then clay-colour ; stem 1–2 in. long, gradually narrowed downwards, paler than the cap, often tinged violet at the base.

Smell resembling meal. Allied to *P. lividus*, but differing in the deeply decurrent, clay-coloured gills.

On the ground in fields, etc.

*P. crassus*.—Cap oblique, almost plane, even, becoming ferruginous ; flesh thin at the edge and thick at the centre, soft and spongy, passing gradually, yellowish brown ; gills decurrent, rather distant, not anastomosing, cinnamon-colour ; stem ½–⅔ in. long, tapering from the apex, excentric, ascending, coloured like the cap.



This species looks much more like a species of *Flammula* than of *Paxillus*.

On trunks, worked wood, etc.

*P. panuoides*.—Cap 2–3 in. across, dimidiate, oyster-shell-shaped or fan-shaped, sessile, or extended behind into a short, stem-like base, minutely pubescent or downy, then almost smooth, dingy yellow; gills decurrent, crowded, branched, crisped and rugulose, yellow.

Very variable. Very distinct from the preceding species in the cap being sessile, or slightly extended behind. At first sessile and resupinate, soon shell-shaped, dimidiate and obovate, at length broadly expanded, wavy and lobed; often imbricated.

On pine and other wood, sawdust, etc.

var. *jagi*.—Gregarious, crisped, pallid above, orange beneath; gills crisped, orange.

On a beech stump.

#### ACETABULARIA

Cap regular; gills free; stem central; universal veil present, remaining as a small volva at the base of the stem. Spores tawny or brown.

*A. acetabulosa*.—Cap about 1 in. across, convex, tan-colour, edge grooved, flesh thin; gills free but close to the stem, distant,  $1\frac{1}{2}$  lines broad, pale brown; stem about 2 in. long, equal, white, hollow, the base surrounded by a small white volva.

The discoverer of this fungus states: "This is very like a poor specimen of *Agaricus congregatus* (= *Coprinus micaceus*), but the pileus is more plaited. The lamellæ are remarkably glandular on their sides; and instead of a bare base or foot it stands in a little socket-like volva."

On the ground, a little above high-water mark.

#### PHOLIOTA

Cap regular, more or less fleshy; gills adnate or adnexed; stem central, with a distinct ring; spores rusty.

The only genus with brown spores having a distinct, membranaceous ring on the stem.

1. *Growing on the ground. Rarely tufted.*

*P. aurea*.—Cap 4–6 in. across, rather velvety, then torn into minute squamules, bright tawny yellow; gills pale orange-rusty; stem 5–8 in. long, stout, pale, covered with rusty scurf below the large spreading ring.

On the ground. Sometimes in tufts of two to four.

*P. caeperata*.—Cap 3–5 in. across, more or less bright yellow, with superficial white flecks; gills tan-colour, edge serrate; stem 4–6 in. long, white, squamulose up to the ring.

In woods. Solitary or 2–3 together.

*P. terrigena*.—Cap  $1\frac{1}{2}$ –3 in. across, silky-fibrillose, pale dingy yellow; gills rusty with an olive tinge; stem about 2 in. long, dingy yellow, with rusty, wart-like squamules, ring small as a rule, part remaining attached to the edge of the cap.

Damp ground in woods.

*P. erebia* (Pl. XXI, fig. 4).—Cap 1–2 in. across, rather viscid, smooth, umber with an olive tinge, pale when dry; gills dingy cinnamon; stem about 2 in. long, striate, soon pale, ring drooping. Fragile, cap often wrinkled, umbonate or depressed.

Grassy places in woods.

*P. ombrophila*.—Cap 2–3 in. across, rusty, then pale tan; gills crowded, becoming rusty; stem 3–4 in. long, pallid, ring white.

In grassy places after much rain.

*P. togularis*.—Cap  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, pale ochraceous; gills crowded; pale rusty; stem 3–4 in. long, often wavy; pale ochre, ring entire, spreading.

Among grass, in gardens, etc.

*P. blattaria*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, rather umbonate, rusty, edge striate; gills crowded, watery cinnamon; stem  $1$ – $1\frac{1}{2}$  in. long, white, ring white.

Known from *P. togularis* by the straight white stem.

In gardens, etc.

*P. præcox*.—Cap  $1\frac{1}{2}$ –3 in. across, soon plane, whitish, then tan-colour; gills crowded, white, then brownish; stem 2–4 in. long, mealy, then smooth, whitish, ring entire, white.

Among grass, in gardens, etc., in spring.

*P. sphaeromorpha*.—Cap  $1\frac{1}{2}$ –2 in. across, soon plane, yellow; gills arcuato-decurrent, dry, becoming brownish; stem 3–4 in. long, silky, yellowish, ring large, entire.

Among leaf-soil, etc.

*P. molliscoria*.—Cap 2–3 in. across, soon plane, tawny yellow, dry and shining; gills crowded, rusty; stem about 3 in. long, straight, silky, pale yellow, ring broad, yellow, then rusty from the spores.

Differs from *P. præcox* in yellow cap and bright rusty gills.

On the ground. Gregarious.

*P. radicata* (Pl. XXI, fig. 3).—Cap 2–4 in. across, pale greyish tan, spotted; gills free, becoming reddish brown; stem 4–6 in. long, and running down into a long tapering root, colour of cap or paler, concentrically squamulose up to the ring, smooth above.

Known by the strong smell, free gills, and tapering rooting stem.

On the ground round stumps.

*P. cookei*.—Cap 1–2 in. across, convex, viscid when moist, pale yellow with darker scales; gills becoming brown; stem about 2 in. long, reddish brown below, whitish upwards, fibrillose up to the imperfect ring.



## PLATE XXI

- |    |          |             |
|----|----------|-------------|
| I. | PHOLIOTA | ADIPOSA     |
| 2. | „        | DISSIMULANS |
| 3. | „        | RADICOSA    |
| 4. | „        | EREBIA      |
| 5. | „        | SQUARROSA   |



PLATE XXI.





Differs from *P. terrigena* in the absence of an olive tinge on the gills.

Among grass. Solitary or tufted.

*P. mycenoides*.—Cap about  $\frac{1}{2}$  in. across, everywhere striate, rusty, tan when dry ; gills narrow, rusty ; stem about  $1\frac{1}{2}$  in. long, rusty, ring white.

Among moss in swamps.

*P. pumila*.—Cap about  $\frac{1}{2}$  in. across, even, ochraceous, rarely brownish cinnamon ; gills adnate, pallid yellowish ; stem 1–2 in. long, yellow, ring only forming a zone round the stem.

Among grass, moss, etc.

*P. molliscoria*.—Cap 2–3 in. across, convex, then plane, at length depressed, even, smooth, soft like kid leather, tawny yellow, edge paler, dry, shining ; flesh very thin, yellow like that of the stem ; gills adnexed, ventricose, crowded, rusty ; stem about 3 in. long, silky, punctately squamulose at the apex, pale yellow, ring distant, broad, yellow, then rusty from the spores.

Habit and appearance of *P. præcox* ; differing in the yellow colour and bright ferruginous spores.

On the ground. Gregarious.

*P. dura*.—Cap about 2 in. across, rather compact, convexo-plane, smooth, becoming cracked, edge even, tawny tan, becoming fuscous ; gills adnate, striato-decurrent by a tooth, broad, livid, then rusty brown ; stem  $1\frac{1}{2}$ –2 in. long, stout, thickest at the mealy apex, somewhat ventricose or irregular, whitish, ring apical, torn.

On the ground in gardens, etc.

2. Growing on trunks, on or around stumps, and on branches.

\* Stem white or whitish.

*P. pudica*.—Cap 1–3 in. across, smooth, even, dry, white or tinged tawny ; gills whitish, then tawny ; stem 1–2 in. long, often curved, white, ring spreading.

On trunks of elder and other trees. Singly or tufted.

*P. leochroma*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, soon plane, tawny ; gills adnate, cinnamon-colour ; stem 3–4 in. long, whitish, ring tawny.

Cap sometimes yellowish white at the edge, passing into a tawny disc, becoming cracked.

On stumps, etc. Tufted.

*P. capistrata*.—Cap  $1\frac{1}{2}$ –2 in. across, rather viscid, pale dingy yellow ; gills slightly decurrent, pallid, then darker ; stem 3–4 in. long, squamulose, whitish, ring white, spreading.

Known by the dingy yellowish white, slightly viscid cap.

On old elm stumps, etc.

*P. ægerita*.—Cap 2–4 in. across, fleshy, soon plane, wrinkled, tawny, edge whitish ; gills crowded, fuscous ; stem 4–6 in. long, fibrillose, white, ring white, thick or tumid.

On trunks of poplar, ash, etc. Tufted.



*P. luxurians*.—Cap 1–2 in. across, gibbous, silky and breaking up into squamules, yellowish white, then rufous brown; gills adnexed, then decurrent, becoming brownish; stem  $1\frac{1}{2}$ –2 in. long, white, then brownish, rather squamulose, ring persistent.

On oak trunks, etc. Tufted and often very irregular.

*P. comosa*.—Cap 3–6 in. across, viscid, dingy tawny, with scattered floccose white flecks; gills slightly decurrent, becoming brownish tan; stem 3–4 in. long, stout, base swollen, whitish, fibrillose below the ring, often curved.

On trunks and stumps of beech, etc. Slightly tufted.

*P. heteroclita*.—Cap 3–6 in. across, soon flattened, slightly excentric, whitish or tinged yellow, spotted with scales, edge usually ragged from remains of veil; gills dark rusty; stem 3–4 in. long, base bulbous, whitish, base darker, ring torn.

Somewhat resembling *P. comosa*, but known at once by the strong, pungent smell, resembling horse-radish.

On trunks, chiefly birch.

*P. dissimularis* (Pl. XXI, fig. 2).—Cap  $\frac{2}{3}$ –1 in. across, often gibbous or obtusely umbonate, lurid, then pale; gills pallid tan; stem  $1\frac{1}{2}$ –2 in. long, white, cottony at the base, ring white, generally persistent.

Known by the dingy brownish olive cap, slightly viscid, and the straight white stem.

On fallen sticks, etc.

*P. mustelina*.—Cap about  $\frac{1}{2}$  in. across, even, smooth, dry, tawny-yellow; gills tawny cinnamon; stem  $\frac{2}{3}$ –1 in. long, pallid whitish with white down at the base, ring white, reflexed.

On stumps and pine wood. Solitary. Rare.

\*\* *Stem distinctly coloured.*

*P. aurivella*.—Cap 3–6 in. across, gibbous, slightly viscid, tawny yellow with darker scales; gills sinuate, becoming rusty umber; stem 4–6 in. long, curved, yellowish with rusty scales, ring imperfect.

*P. adiposa* differs in the glutinous cap and viscid stem; *P. spectabilis* differs in the dry (not viscid) cap and adnato-decurrent gills.

On trunks; tufted or solitary.

*P. grandis*.—Cap convex, then expanded and broadly gibbous, dry, with innate deep tawny squamules at the circumference, and becoming recurved at the disc, 9–12 in. across; flesh light yellow,  $2\frac{1}{2}$  in. thick at the centre; gills very broad, narrowed in front, deeply sinuato-decurrent, pallid, then fuscous; stem thick, solid, fusiform, squamulose and tawny above the ring, apex deeply striate, 9–12 in. long; ring distant, almost fugacious.

Tufted. Smell and taste very pleasant. Known by its large size. Intermediate between *P. squarrosa* and *P. spectabilis*.

At the base of ash stumps, etc.

*P. squarrosa* (Pl. XXI, fig. 5).—Cap 2–4 in. across, often gibbous, dry, yellowish brown with darker spreading scales ; gills pallid olive, then rusty ; stem 3–5 in. long, tawny brown with darker recurved scales up to the spreading ring, smooth above.

On trunks of trees and on or near stumps. Tufted ; strong-smelling.

*P. subsquarrosa*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, viscid, rusty brown with darker adpressed scales ; gills yellow, then dingy tan ; stem  $2\frac{1}{2}$ –3 in. long, yellow with darker spreading scales up to the ring.

The habit and general appearance of *P. squarrosa*, differing in the almost free gills.

On dead wood and round stumps. Somewhat tufted.

*P. spectabilis*.—Cap 3–5 in. across, dry, bright tawny orange, broken up into silky fibrillose scales ; gills adnato-decurrent, crowded, yellow, then rusty ; stem 3–4 in. long, stout, swollen below the middle, rooting, yellow tinged with tawny up to the large, spreading, persistent ring.

On trunks and stumps. Tufted. A destructive tree parasite.

*P. adiposa*.—Cap 2–4 in. across, convex, glutinous, yellow with concentric darker scales ; gills adnate, yellow, then rusty ; stem 3–6 in. long, somewhat bulbous, yellow with rusty scales up to the spreading ring, glutinous.

Distinguished by the glutinous cap and stem.

On trunks. Tufted. A destructive parasite.

*P. lucifer*.—Cap  $1$ – $2\frac{1}{2}$  in. across, soon plane and becoming umbonate, viscid, yellow with darker scales that soon disappear ; gills yellow, then rusty ; stem  $1$ –2 in. long, yellowish, base rusty, somewhat squamulose, ring distant from top of stem.

Smaller and slenderer than *P. adiposa*.

On trunks, branches, straw, etc.

*P. flammans*.—Cap  $1$ –2 in. across, slightly umbonate, dry, tawny yellow with minute pale yellow squamules ; gills yellow, then tawny ; stem  $2$ – $2\frac{1}{2}$  in. long, rather wavy, yellow with spreading squamules up to the ring.

On pine trunks and on pine needles.

*P. junonia*.—Cap  $2$ – $3\frac{1}{2}$  in. across, soon plane, often gibbous, dry, even, smooth, rich yellow or tawny yellow ; gills yellow, then tawny ; stem 2–4 in. long, yellowish upwards, tawny below, smooth, ring large.

The solitary or subsolitary habit and smooth cap and stem mark the species. Requires to be carefully distinguished from forms of *Flammula hybrida* having a ring.

On trunks.

*P. tuberculosa*.—Cap  $1$ –2 in. across, dry, smooth, then broken up into squamules, tawny yellow ; gills yellow, then rusty, edge



serrulate ; stem 1–1½ in. long, more or less bulbous, rooting, yellowish, ring soon disappearing.

On trunks, chiefly birch.

*P. curvipoda*.—Cap 1–2 in. across, with minute adpressed squamules, tawny yellow ; gills broadly adnate, yellowish, then tawny ; stem 1–2 in. long, incurved, fibrillose, yellow, ring floccose.

On trunks. Gregarious or somewhat clustered.

*P. cruentata*.—Cap about 2 in. across, dry, yellow, breaking up into darker scales, edge inturned ; gills yellow, then tan-colour ; stem 1½–2 in. long, curved, colour of the cap, narrowed at the base and rooting, and there dark red-brown, flesh pale yellow, changing to cinnabar-colour, ring fibrillose.

Known by the dark-coloured rooting base of stem, and the cinnabar-coloured flesh.

On oak stumps, also on burnt ground.

*P. paxillus*.—Cap 3–5 in. across, often rather wavy, dark cinnamon-colour, paler when dry ; gills rather decurrent, crowded, broad, cinnamon ; stem 4–6 in. long, smooth, even, cinnamon, ring narrow, spreading.

Entirely cinnamon when moist.

On trunks. Solitary.

*P. confragosa*.—Cap 1–1½ in. across, soon plane, edge striate, rufous cinnamon, then tawny ; gills crowded, reddish brown ; stem about 2 in. long, rufous, fibrillosely peronate up to the ring.

Cap at first with whitish floccose squamules.

On trunks. Somewhat tufted, fragile.

*P. mutabilis*.—Cap variable, 1–4 in. across, soon expanded and usually obtusely umbonate, smooth, deep cinnamon-colour, becoming pale ; gills adnato-decurrent, crowded, pallid, then cinnamon-colour ; stem 1¼–4 in. long, equal, with spreading scales up to the ring, incurved, pale above, brownish below.

On and around stumps, etc. Densely tufted.

*P. marginata*.—Cap about 1 in. across, soon expanded, smooth, edge striate, honey-colour, then pale tan ; gills crowded, watery cinnamon ; stem 1½–2 in. long, pale tan, not scaly, ring disappearing.

Close to *P. mutabilis*, but smaller and not densely tufted, and cap honey-colour, then paler.

On trunks, pine needles, etc.

*P. unicolor*.—Cap about ½ in. across, slightly umbonate, smooth, bay, ochraceous when dry ; gills almost triangular, ochraceous cinnamon ; stem 1–1½ in. long, smooth, colour of the cap, ring entire.

On trunks and branches. Gregarious or somewhat tufted.

*P. sororia*.—Cap convex, then expanded, slightly striate and squamulose, tawny cinnamon, 1–1½ in. across ; gills sinuato-adnate,

crowded, pallid, then cinnamon; stem equal, wavy, hollow, pale honey-yellow with white fibrils, apex scurfy, about 2 in. long.

Closely allied to *P. marginata*.

On chips and twigs lying on the ground.

### PLUTEOLUS

Cap regular, conical or campanulate, then expanded, edge at first straight and pressed to the stem; gills free; stem central; spores rusty.

A small genus agreeing structurally with *Pluteus*; differing in having rusty spores.

*P. reticulatus*.—Cap  $1\frac{1}{2}$ –2 in. across, viscid, greyish or pale lilac, with raised ribs that form an irregular network; gills rusty saffron; stem  $1\frac{1}{2}$ –2 in. long, fibrillose, white.

On dead wood. Rare.

*P. aleuriatus*.—Cap about  $\frac{2}{3}$  in. across, viscid, not wrinkled, greyish or pink; gills ochraceous saffron; stem  $1\frac{1}{2}$ –2 in. long, white, powdery.

On rotten sticks, etc. Fragile. Rare.

### BOLBITIUS

Cap regular, membranaceous; gills free or adnexed, rusty, soft, and dissolving; stem central; spores rusty.

Very delicate and fragile, gills deliquescing into mucus, the whole plant soon deliquescing. Growing on dung or rich ground.

\* *Stem white*.

*B. grandiusculus*.—Cap  $1\frac{1}{2}$ –2 in. across, campanulate, then expanded, smooth, slightly striate, pale yellow, disc rufous; gills free, crowded, rusty ochre; stem narrowed upwards, smooth, even, straight, 3–4 in. long.

Known by the narrow, free gills and long, pure white, tapering stem. Among grass.

*B. vitellinus*.—Cap  $1\frac{1}{2}$ –2 in. across, soon expanded, clear, deep yellow, edge even, then grooved; gills narrow, ochraceous tan; stem about 3 in. long, white, and covered with white squamules.

On dung and in rich pastures. Somewhat tufted.

*B. apicalis* (Pl. XXVI, fig. 2).—Cap  $\frac{2}{3}$ –1 in. long, persistently conical, brownish, striate, subumbonate; gills free, bright brown; stem about  $1\frac{1}{2}$  in. long, base thickened, striate.

Distinguished by the cap being striate and brown up to the smooth, ochraceous disc.

In pastures.

*B. rivulosus*.—Cap about  $1\frac{1}{2}$  in. across, campanulate, striate, dingy tan-colour; gills rather distant, cinnamon; stem about 3 in. long, straight, smooth.

In conservatories.



*B. niveus*.—Cap about 1 in. across, obtusely umbonate, striate, pure white; gills free, becoming salmon-colour; stem about 4 in. long, bulbous, shining white.

In conservatories.

*B. tener*.—Cap  $\frac{1}{3}$ –1 in. long, permanently conical, yellowish white; gills salmon-colour; stem  $1\frac{1}{2}$ –3 in. long, clavato-bulbous, white.

Among grass.

\*\* *Stem yellow*.

*B. flavidus*.—Cap 1–2 in. across, glutinous, conical, then expanded, striate, pale yellow; gills yellow, then dusky brown; stem about 2 in. high, yellow.

On dunghills, etc.

*B. boltoni*.—Cap about 1 in. across, viscid, even, then the margin becomes grooved, yellow, disc darker and subdepressed; gills yellow, then brown; stem 2–3 in. long, yellowish, at first floccose. Deliquescing.

On dung, amongst leaves and dung, etc.

*B. fragilis* (Pl. XXVI, fig. 3).—Cap about 1 in. across, viscid, striate, somewhat umbonate, yellow, becoming pale; gills pale cinnamon; stem 2–3 in. long, smooth, straight, yellow.

More slender than *B. boltoni*, and drying and becoming papery, not deliquescing.

On dung or amongst grass.

*B. titubans*.—Cap  $\frac{2}{3}$ –1 in. across, becoming expanded, yellow; gills becoming salmon-colour; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, straight, shining, yellowish.

Among grass, etc.

#### INOCYBE

Cap symmetrical, flesh thin, fibrillose and becoming more or less cracked in lines from the disc to the margin, or broken up into scales which may be depressed or spreading, dry or rarely slightly viscid; attachment of gills varying from adnate to free, brownish or dingy; spores pale brown, smooth or warted; cystidia often present; stem central.

The species of *Inocybe* are by common consent admitted to be practically impossible to determine in the field by those superficial characters which in most instances suffice. On the other hand, when microscopic characters are taken into consideration, it is found that the species fall into distinctly marked groups, furnishing an easy means of determining the species.

The microscopic characters to be relied upon are the spores, which divide the species into two groups, depending on whether the wall of the spore is smooth, or rough with warts or spines. The second character turns on the presence or absence of cystidia in the gills. Cystidia, as previously explained, are very large, more or less thick-walled cells present in the hymenial tissue, and pro-

jecting much beyond the basidia when a portion of a gill is seen in section under the microscope.

## KEY TO THE SPECIES

A. *Spores rough.*

- \* *Cystidia present.*
- † Stem whitish or very pale.
- †† Stem coloured.
- \*\* *Cystidia absent.*
- † Stem whitish or very pale.
- †† Stem coloured.

B. *Spores smooth.*

- \* *Cystidia present.*
- † Stem whitish or very pale.
- †† Stem coloured.
- \*\* *Cystidia absent.*
- † Stem whitish or very pale.
- †† Stem coloured.

A. *Spores rough.*

- \* *Cystidia present.*
- † Stem whitish or very pale.

*I. fibrosa*.—Cap bell-shaped, then expanded and gibbous, silky, whitish to pale yellowish brown, edge cracking, 2–4 in. across; gills nearly free, dingy ochre; stem stout, narrowed and floccose upwards, whitish, 3–4 in. long (spores irregularly oblong, slightly warted,  $10-12 \times 7-7.5 \mu$ ; cystidia ventricose).

A fine, large species. Differs from *I. perlata* in having warted spores.

On the ground in pine woods.

*I. asterospora*.—Cap bell-shaped, then expanded and umbonate, even and almost smooth, becoming cracked and fibrous, brownish to dingy cinnamon, 1–2 in. across; gills emarginate, dingy cinnamon; stem cylindrical, minutely bulbous, almost smooth, becoming tinged red and streaked with brown fibrils, 2–3 in. long (spores stellately nodulose,  $10-13 \mu$  diam., cystidia ventricose).

This species was for a long time confounded with *I. rimosa*, which differs in having smooth spores. *I. margaritispora* differs in having no cystidia.

On the ground in woods.

*I. trechispora*.—Cap convex, soon almost plane and umbonate, viscid at first, then dry and silky, pallid or whitish, umbo often tinged ochre, up to 1 in. across; gills whitish, then greyish cinnamon; stem pallid, often slightly wavy, with a mass of white



mycelium at the base,  $1\frac{1}{2}$ –2 in. long (spores nodulose,  $7\text{--}8 \times 5\text{--}6 \mu$ , cystidia spindle-shaped or subventricose).

Superficially resembling *I. geophylla*, differing in having warted spores.

In woods and damp places.

*I. infida*.—Entirely white. Cap conico-campanulate, then expanded and umbonate, silky-fibrillose or more or less squamulose, white, or slightly tinged grey or yellow, edge often splitting, about 1 in. across; gills free, crowded, greyish cinnamon; stem solid, minutely pruinose, apex scurfy, white,  $1\frac{1}{4}$ –2 in. long (spores irregularly globose-oblong, nodulose,  $9\text{--}10 \times 6\text{--}7 \mu$ ; cystidia fusiform or subventricose).

Superficially indistinguishable from *I. geophylla*, from which it differs in having nodulose or warted spores. Probably common in England, but passed over as *I. geophylla*. This fungus was called *I. commixta* by Bresadola, who presumably did not know that it had been previously named *I. infida*.

On the ground in woods.

*I. prætervisa*.—Cap conico-campanulate, then expanded, umbonate or gibbous, slightly viscid, fibrillose, fawn-colour, edge generally darker,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills adnexed, narrowed behind, almost free, cinnamon, edge white; stem with a marginate bulb, white, then tinged straw-colour,  $2\text{--}2\frac{1}{2}$  in. long (spores rough,  $9\text{--}11 \times 5\text{--}6 \mu$ ; cystidia ventricose,  $55\text{--}75 \times 18\text{--}30 \mu$ ).

†† Stem coloured.

*I. fasciata*.—Tufted. Cap campanulato-convex, silky, disc rufous, remainder pale tan, everywhere covered with minute, dark, spreading scales, 2–3 in. across; gills crowded, pallid; stem fibrillose, reddish inside and outside below, pallid above, 2–3 in. long (spores minutely warted,  $10 \times 6 \mu$ ; cystidia ventricose).

Known from every other species of *Inocybe* by the densely tufted habit.

On the ground among grass.

*I. lanuginosa*.—Cap convex, then expanded, velvety, with minute erect squamules at the disc, umber or brown, then yellowish, up to  $\frac{3}{4}$  in. across; gills becoming brown, edge white and fimbriate; stem slender, fibrillose or downy, brown, apex white and mealy, about 1 in. long (spores warted,  $9\text{--}12 \times 8 \mu$ ; cystidia spindle-shaped).

On the ground in woods.

*I. calospora*.—Cap convex or bell-shaped, then expanded and umbonate, fibrillose with darker squamules at the disc, yellowish brown or tawny grey, edge paler, up to 1 in. across; gills almost free, tawny ochre or brownish; stem slender, pale, then reddish or like the cap, 1–2 in. long (spores globose with numerous slender cylindrical warts,  $10\text{--}12 \mu$ ; cystidia subcylindrical).

On the ground in woods and shady places.

*I. trinii*.—Cap hemispherical, whitish with a rufous tinge, due to longitudinal rufous fibrils, tawny when dry, up to  $\frac{2}{3}$  in. across; gills dusky cinnamon with a white, floccose edge; stem covered with reddish fibrils, apex with white meal, up to 2 in. long (spores warted, 9–10, or 9–10  $\times$  6–8  $\mu$ ; cystidia ventricose, abundant).

Smell strong, fragrant, resembling clove-pinks.

Among grass.

*I. maritima*.—Cap convex, then almost plane and umbonate, floccosely fibrillose or subsquamulose, brownish mouse-colour or umber, paler and hoary when dry, up to 1 in. across; gills almost free, grey, then rusty; stem equal, straight, fibrillose, slightly paler than the cap, apex naked, up to 1 in. long (spores warted, 10–11  $\times$  7–8  $\mu$ ; cystidia ventricose).

Distinguished by the umber hygrophanous cap becoming pale and hoary when dry. Often tufted.

Damp sand on the seashore, also on the ground in woods.

*I. fulvella*.—Cap conico-campanulate, then expanded and umbonate, silky, honey-colour tinged olive, umbo darker, 3–5 in. across; gills ventricose, rounded behind and almost free, lilac, then cinnamon; stem lilac, but soon changing to brownish, apex with white meal (spores warted, 7–9  $\times$  5–6  $\mu$ ; cystidia ventricose, 45–60  $\times$  10–18  $\mu$ ).

The lilac colour of the stem, flesh, and gills can only be observed when the fungus is quite fresh.

Among moss.

*I. renneyi*.—Cap hemispherical, slightly fibrillose, disc brown, remainder pale fawn-colour, up to  $\frac{2}{3}$  in. across; gills almost free, dingy ochre; stem slightly narrowed below, fibrillose, paler than the cap, 1½–2 in. long (spores slightly warted, 11–13  $\times$  7–8  $\mu$ ; cystidia spindle-shaped).

On the ground in woods, etc.

var. *major*.—Like the typical form, but larger.

In fir woods.

\*\* *Cystidia absent*.

† Stem whitish or very pale.

*I. margaritispota*.—Cap bell-shaped, then expanded and broadly umbonate, often wavy, silky, clad with fibrillose scales, fawn-colour or pale yellowish brown, 1½–2 in. across; gills adnexed, pallid; stem equal, fibrillose, pallid, 1½–2 in. long (spores coarsely warted, 8–9  $\mu$  diam.).

Resembles *I. asterospota* in general appearance and in spore characters, but has no cystidia. *L. eutheles* differs in its smooth spores.

On the ground.



†† Stem coloured.

*I. bucknalli*.—Cap campanulato-convex, fibrillose with a few squamules near the disc, brownish,  $\frac{1}{2}$ – $\frac{2}{3}$  in. diam.; gills thick, rather distant, rusty brown, edge minutely fimbriate; stem slender, fibrillose, brownish, 1–1½ in. long (spores coarsely warted, 15–17 × 8–9  $\mu$ ). The basidia are exceptionally large, 70–80 × 16–18  $\mu$ ).

A little insignificant-looking brown fungus without any pronounced external features, but known at once by the size of the basidia, which are more than twice the size of any other known species. The spores and paraphyses are also exceptionally large.

On the ground under bushes.

### B. *Spores smooth*.

\* *Cystidia present*.

† Stem whitish or very pale.

*I. scabra*.—Cap broadly conical, often subgibbous, dusky or pale yellowish tan, variegated with fibrous, adpressed darker scales,  $\frac{1}{3}$ –1½ in. across; gills adnexed, somewhat crowded, pale, then dusky; stem stout, short, whitish, silky-fibrillose, about 1 in. long (spores pip-shaped, 9–11 × 5–6  $\mu$ ; cystidia slightly ventricose).

On the ground in coniferous and mixed woods.

*I. pyriodora*.—Cap ovate, then campanulate, at length expanded and umbonate, pale ochre, sometimes reddish when young, 2–3 in. across; gills adnate, thin, crowded, brownish, edge whitish; stem nearly equal, often curved near the base, fibrillose, pallid, apex with white meal, flesh reddish when cut, 2–3 in. long (spores pip-shaped, 9–10 × 5–6  $\mu$ ; cystidia variable, ventricose or clavate).

Smell strong, resembling rotten pears, or that of the hyacinth.

On the ground in woods.

*I. rimosa* (Pl. XXIV, fig. 8).—Cap bell-shaped, sometimes sub-umbonate, silky-fibrous and becoming much cracked from the disc to the margin, yellowish brown, 1–2 in. across; gills almost free, somewhat crowded, dingy tan; stem equal, nearly smooth, whitish, apex mealy, 2–3 in. long (spores pip-shaped, 12–15 × 7  $\mu$ ; cystidia ventricose, scattered).

Differs from *I. asterospora* and *I. fastigiata* in the smooth spores.

*I. eutheles* differs in having adnate gills and an umbonate cap.

*I. pyriodora* is separated by the strong smell.

On the ground in woods.

*I. eutheles*.—Cap bell-shaped, then expanded and strongly umbonate, shining, silky, rather squamulose, pale fawn-colour, up to 1 in. across; gills broadly adnate, narrowish, pallid, edge whitish and denticulate; stem fibrous, pallid or whitish, 2–3 in. long (spores elliptical, 9–10 × 5–5.5  $\mu$ ; cystidia stout, ventricose).

Bears a general resemblance to *I. fastigiata*, but differs in having smooth spores.

On the ground among pine leaves.

*I. sambucina*.—Cap convex, then expanded, often wavy, silky-fibrillose, nearly smooth and not cracking, white, often tinged yellow, 2–3 in. across; gills broad, whitish, then dingy ochre; stem stout, short, often curved, fibrillosely striate, white, 1–1½ in. long (spores elliptical, 9–12 × 6  $\mu$ ; cystidia ventricose).

A stout fungus, entirely white, cap often becoming yellowish with age. *I. sindonia* differs in the narrow gills, stuffed then hollow stem, and smaller spores.

In dry pine woods, etc.

*I. pallidipes*.—Cap conico-campanulate, then expanded and umbonate, light brown, fibrose-squamose, disc innately scaly, edge subrimose, about 1 in. across; gills broadly attached, with a strong decurrent tooth, becoming ventricose, scarcely crowded, rather broad, pale cinnamon, edge paler and fimbriate; stem slightly narrower and mealy above, loosely fibrillose below, sub-bulbous and with white down at the base, solid, white, 1–2 in. long (spores pip-shaped, smooth, 8–9 × 5  $\mu$ ; cystidia fusoid or subventricose, numerous).

Well marked by the white stem and the conico-campanulate cap. First collected in this country at the Fungus Foray of the Essex Field Club, in Epping Forest, October, 1910.

On the ground in woods.

*I. corydalina*.—Cap campanulate, then expanded, umbonate, whitish with darker fibrils, umbo green, 1½–2 in. across; gills adnate, brown, edge white; stem often curved, sub-bulbous, whitish, pruinose, 3–4 in. long (spores elliptical, smooth, brown, 7–9 × 4–5  $\mu$ ; cystidia ventricose, 42–57 × 15–18  $\mu$ ).

Easily known by the green umbo.

*I. clarkii*.—Cap bell-shaped, silky-fibrillose, whitish, about 1 in. across; gills rather distant, pallid, edge white; stem solid, white, 1½–2 in. long (spores elliptical, 8–10 × 5–6  $\mu$ ; cystidia ventricose, scattered).

Allied to *I. sindonia*, but differs in the solid stem, persistently pale gills and larger spores.

On the ground in shady places.

*I. geophylla*.—Cap conical, then expanded and umbonate, minutely fibrillose, satiny and shining, often cracking, pure white, sometimes tinged yellow when old, about 1 in. across; gills almost free, rather broad, crowded, pale, then dingy clay-colour; stem satiny, white, often slightly wavy, 1½–2½ in. long (spores elliptical, 7–9 × 4–5  $\mu$ ; cystidia ventricose).

Smell earthy. Remarkable for its satiny appearance. Typically pure white, but very variable in the colour of the cap, which ranges from white, the most frequent condition, to yellow, lilac, violet, tawny and brick-red.

On the ground in woods, etc.



*I. whitei*.—Cap conical, then convex, sometimes umbonate, fibrillose, tawny, edge whitish, then entirely pale tawny, slightly viscid, about 1 in. across; gills crowded, white, then cinnamon; stem whitish and powdery, becoming brownish below,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long (spores pip-shaped, ventricose or almost cylindrical).

Allied to *I. geophylla*, differing in the slightly viscid cap and larger spores.

On the ground under conifers.

*I. sindonia*.—Cap campanulato-convex, broadly umbonate, silkily downy when young, then almost smooth, never fibrillose, when young the edge is more or less fringed, white, pallid or yellowish,  $1\frac{1}{2}$ –2 in. across; gills narrow, brownish white; stem soft, becoming hollow, white, 2–3 in. long (spores pip-shaped,  $8-10 \times 5-6 \mu$ ; cystidia ventricose).

Superficially resembling *I. geophylla*, differing in the hollow stem, larger size and absence of earthy smell.

On the ground in damp, shady places.

*I. descissa*.—Cap conico-campanulate, then expanded, the edge usually slightly incurved, fibrillose, becoming radially cracked and splitting when expanded, whitish or pale dingy brown, up to 1 in. across; gills almost free, white, then brown; stem almost hollow, often slightly wavy, fibrillose, white, apex with white meal,  $1-1\frac{1}{2}$  in. long (spores elliptic-oblong,  $8-10 \times 5 \mu$ ; cystidia ventricose, scattered).

A small species, somewhat like *I. geophylla*, differing in the colour of the cap, and in the absence of a strong, earthy smell.

On the ground in woods.

*I. scabella*.—Cap campanulate, then expanded, more or less umbonate, dry, silky-fibrillose and becoming broken up into squamules, except at the umbo, rusty brown, sometimes dingy ochraceous, about 1 in. across; gills adnexed, dingy pallid, then brownish; stem  $1\frac{1}{2}$ –2 in. long, slender, straight or wavy, smooth, rufous or pallid (spores irregularly nodulose,  $10 \times 7 \mu$ ; cystidia ventricose).

A variable species. Stature of *I. geophylla*, but more slender. Flesh pallid, cap not at all rimose or cracked, the obtuse umbo remaining even and smooth.

Among grass in woods, etc.

*I. cervicolor*.—Cap bell-shaped, pale brown or fawn-colour, and covered with brown recurved fibrils, 1–2 in. across; gills distant, pale, then rusty brown, edge whitish, uneven; stem elongated, slender, firm, whitish with recurved brown fibrils throughout its length,  $2\frac{1}{2}$ –4 in. long (spores pip-shaped,  $11-13 \times 6-6.5 \mu$ ; cystidia numerous, cylindric-fusoid).

Smell strong, unpleasant. Flesh white, tinged purplish when cut.

Among grass in woods.

*I. deglubens*.—Cap convex, then expanded and obtusely umbonate, the cuticle becoming broken up into adpressed fibres, disc more or less squamulose, brownish bay, then yellowish, fibres and squamules smaller, up to 1 in. across; gills adnate, rather distant, greyish, then cinnamon; stem almost smooth, pallid, sometimes tinged lilac, apex rather rough with brown points, 2–2½ in. long (spores pip-shaped, 8–10 × 5–6  $\mu$ ; cystidia ventricose).

Differs from *I. lacera* in the apex of the stem being darkest and not white and mealy.

On the ground in pine woods, etc.

*I. destrecta*.—Cap convex, then expanded, usually becoming depressed round the umbo, pallid, then rufescent, the cuticle cracked and showing the white flesh, cuticle sometimes broken up, 2–3 in. across; gills adnate, crowded, whitish, then dusky with an olive tinge; stem smooth, fibrillose striate, whitish, reddish with age, apex slightly mealy, 1½–2 in. long (spores pip-shaped, 8–9 × 5–6  $\mu$ ; cystidia abundant, ventricose).

The cap becomes dark brown with age, especially the disc. Cuticle usually much cracked.

On the ground in pine woods, etc.

*I. godeyi*.—Cap campanulate, obtusely umbonate, silky-fibrillose, cracked, whitish, becoming tinged rosy, and ochre, edge splitting, 1½–2 in. across; gills almost free, somewhat crowded, dusky with an olive tinge, edge white, downy; stem slightly bulbous, colour of the cap, apex with white meal, 1½–2½ in. long (spores elliptical, 9–12 × 5–6  $\mu$ ; cystidia ventricose).

Smell strong, unpleasant. One of the larger species, characterized by the cap and stem being pure white or nearly so, and silky when young, then becoming tinged rosy or rosy ochre. These tints also appear when the plant is bruised.

On the ground in woods.

*I. lucifuga*.—Cap convexo-campanulate, then expanded and more or less umbonate, fibrillose or covered with minute adpressed scales, olive or brownish, rarely fawn-colour, then pale, up to 1 in. across; gills nearly free, crowded, white, then yellowish, at length dark olive; stem almost smooth, often rather wavy, pallid, apex with white meal, 1½–2 in. long (spores pip-shaped, 9–10 × 5–6  $\mu$ ; cystidia ventricose).

Smell strong, somewhat resembling radishes. Known by the deep olive gills, almost smooth stem and strong smell.

In pine woods, etc.

*I. cæsariata*.—Cap convex, then expanded, broadly subumbonate, tawny ochraceous, densely covered with spreading ochraceous fibrils which are sometimes in tufts, ⅔–1½ in. across; gills adnexed, pale ochraceous, edge quite entire; stem loosely fibrillose, pale ochra-



ceous, sometimes slightly wavy, 2–3 in. long (spores pip-shaped,  $8-10 \times 4-5 \mu$ ; cystidia narrowly ventricose).

In beech woods, etc.

*I. obscura*.—Cap campanulato-convex, radially fibrillose, disc squamulose, brown with more or less of a violet tinge, up to 1 in. across; gills crowded, olive, then brownish; stem elongated, often wavy, fibrillose, coloured like the cap, 2–3 in. long (spores pip-shaped,  $8-10 \times 5-6 \mu$ ; cystidia ventricose, abundant).

Smell strong. Flesh tinged lilac at apex of stem, as in *I. cinnata*.

On the ground in damp pine woods.

*I. lacera*.—Cap convex, then expanded, and often obtusely umbonate, smooth at first, then scaly, the scales soon spreading, brownish, then mouse-colour, about 1 in. across; gills sinuate, adnexed, pinkish, then mouse-colour; stem slender, short, covered with brown, fibrillose flecks, paler than the cap,  $1-1\frac{1}{2}$  in. long (spores pip-shaped,  $9-11 \times 5-5.5 \mu$ ; cystidia ventricose, abundant).

Differs from *I. scaber* and *I. mutica* by the reddish flesh of the stem.

On the ground in pine and mixed woods.

*I. carpta*.—Cap convex, becoming almost plane, usually at length depressed at the disc, everywhere densely fibrillose, the fibrils sometimes collected into erect squamules which are somewhat concentrically arranged in old specimens, dusky brown, up to 1 in. across; gills adnate, then separating from the stem, broad, becoming dark brown; stem hollow, covered with a spreading fibrillose woolliness, paler than the cap,  $1\frac{1}{2}-2$  in. long (spores pip-shaped,  $8-10 \times 5-6 \mu$ ; cystidia ventricose, often slightly curved, numerous).

On the ground in woods, etc.

*I. hystrix*.—Cap convex, then expanded, orbicular, dull brown to mouse-colour, covered with spreading recurved scales which become fibrillose towards the margin, 2–3 in. across; gills adnate, crowded, broadish, greyish, then brown; stem solid, coloured like the cap, with spreading recurved concentric rings of scales up to a distinctly marked annular zone, pallid and smooth above,  $2\frac{1}{2}-3\frac{1}{2}$  in. long (spores pip-shaped,  $11-13 \times 5-6 \mu$ ; cystidia ventricose).

Flesh white. No tinge of blue or green on the stem. Presents the general appearance of a small specimen of *Pholiota squarrosa*. Sometimes rather small.

On the ground in woods.

*I. incarnata*.—Cap bell-shaped, then expanded and broadly umbonate, fibrillose, then squamulose, yellowish red to flesh-colour, edge fimbriate,  $2-3\frac{1}{2}$  in. across; gills broad, greyish cinnamon, then spotted with red or entirely reddish, edge paler, fimbriate; stem solid, somewhat rooting, slightly fibrillose, reddish, apex white and scurfy, flesh red from the first,  $2\frac{1}{2}-3\frac{1}{2}$  in. long (spores pip-shaped,  $9-10 \times 6 \mu$ ; cystidia ventricose or clavate).

Differs from *I. pyriodora* in being altogether stouter, deeper red in colour and a stronger smell, resembling hyacinth flowers.

In pine and other woods.

*I. brunnea*.—Cap campanulate, umbonate, fibrillosely silky, then cracked, chestnut, about  $\frac{1}{4}$  in. across; gills emarginate, uncinat, creamy, then bistre, edge white and crenulate; stem solid, thickened at the base, clear brown, apex white and pruinose, about 1 in. long (spores pip-shaped, smooth,  $9-12 \times 4-5 \mu$ ; cystidia ventricose, scattered, and apt to be overlooked).

Grassy places in woods.

*I. mutica*.—Cap convex, then becoming plane or slightly depressed, whitish or tinged straw-colour with darker adpressed scales, 1-2 in. across; gills adnate, crowded, tinged brown; stem short, rather stout, hollow, fibrillose, straw-colour, 1-2 in. long (spores pip-shaped,  $8-9 \times 5 \mu$ ; cystidia ventricose, abundant).

Sides of paths in woods, etc.

*I. nigrodisca*.—Cap convex, then almost plane or depressed, umbonate, minutely fibrillose, blackish brown, edge greyish,  $\frac{1}{2}-\frac{2}{3}$  in. across; gills free or slightly adnexed, rounded behind, crowded, greyish, then rusty brown, sometimes tinged yellow; stem slender, firm, solid, wavy, downy, reddish brown,  $1-1\frac{1}{2}$  in. long (spores elongated, smooth,  $5-6 \times 4-5 \mu$ ; cystidia fairly abundant, ventricose).

This species, previously only known from the United States, has recently been collected in Kent.

Among moss and grass.

*I. hæmacta*.—Cap bell-shaped, then expanded, umber becoming paler towards the edge, clad with long darker fibrils, disc darkest and rather scaly,  $1-1\frac{1}{2}$  in. across; gills adnate, dingy tan; stem whitish above, tinged verdigris green at the base, solid, smooth, rather stout,  $1\frac{1}{2}-2$  in. long (spores pip-shaped,  $9-11 \times 5 \mu$ ; cystidia ventricose).

Flesh everywhere changing to red when cut. The green colour of the stem extends through the flesh. Differs from *I. calamistrata* in the absence of spreading scales on the cap.

Among short grass, etc.

*I. flocculosa*.—Cap convex, umbonate, silky-squamulose, brownish fawn-colour, about 1 in. across; gills rounded behind and adnate, pale fawn, then rusty, edge white; stem fibrillose, apex squamulose, brownish beneath the fibrils, about  $1\frac{1}{2}$  in. long (spores elliptical,  $8-10 \times 5-6 \mu$ ; cystidia ventricose, abundant).

Allied to *I. lanuginosa* and *I. lacera*; the former differs in the obtuse cap with spreading scales at the disc, and the latter in the naked apex of the stem.

On naked soil and among grass.

*I. dulcamara*.—Cap bell-shaped, then expanded and umbonate, brownish olive, floccosely scaly, edge more or less fimbriate and



silky, 1-2 in. across; gills narrowed behind, rounded in front, crowded, pallid, then clear olive; stem fibrillose, adpressedly scaly, apex mealy, paler than the cap, 2-2½ in. long (spores pip-shaped, 11-13 × 5-6  $\mu$ ; cystidia ventricose; flesh tinged yellow).

On the ground in pine woods; gregarious.

*I. relicina*.—Cap conical, then expanded, covered everywhere with spreading scales, dingy brown, up to 1 in. across; gills slightly adnexed, crowded, yellow, then olive; stem solid, soft, fibrillosely scaly, apex paler, 1½-2½ in. long (spores pip-shaped, 10-12 × 7  $\mu$ ; cystidia ventricose).

Most nearly allied to *I. dulcamara*, which differs in having an umbonate cap with an olive tinge.

Damp pine woods among *Sphagnum*, etc.

*I. bongardi*.—Cap bell-shaped, then expanded, obtusely umbonate, whitish with a rufescent or yellowish tinge, covered with darker squamules, 1½-3 in. across; gills crowded, broad, whitish, then olive-cinnamon, finally dusky cinnamon; stem straight, tough, almost smooth, colour of the cap, apex with white meal, 2-3½ in. long (spores pip-shaped, 8-10 × 5-6  $\mu$ ; cystidia ventricose).

Flesh reddish when cut. Smell pleasant, like ripe pears.

In woods.

*I. cincinnata*.—Cap convex, then expanded, dusky brown, disc with more or less erect squamules, edge fibrillose, ½-1½ in. across; gills adnexed, crowded, brownish violet; stem solid, rigid, slender, fibrillosely squamulose, apex tinged violet at first, 1-1½ in. long (spores pip-shaped, 8-12 × 5-6  $\mu$ ; cystidia ventricose).

Flesh white except apex of stem, which is lilac at first.

On the ground in woods.

\*\* *Cystidia absent*.

† *Stem whitish or very pale*.

*I. perlata*.—Cap convex, then expanded and broadly umbonate, streaked with darker fibrils, disc darker, fuscous, edge paler and incurved, 3-4 in. across; gills rounded behind, broad, pallid, then pale umber; stem straight or curved, fibrously striate, pallid and mealy above, paler below, 3-4 in. long (spores elliptical, 9-12 × 6-7  $\mu$ ).

Resembling *I. fibrosa* in size, differing in having smooth spores and a darker cap.

In woods under hornbeam, etc.

*I. perbrevis*.—Cap convex, then expanding until almost plane, obtusely umbonate, often depressed round the umbo, fibrillosely silky or minutely squamulose, rufous brown, becoming tinged yellowish, edge fibrillose and often splitting, ½-1½ in. across; gills adnexed, with a decurrent tooth, rather distant, pale, then tan-colour; stem pallid and white fibrillose, up to 1 in. long (spores elliptic-oblong, 8-9 × 4.5-5  $\mu$ ).

In beech woods. Solitary.

*I. vatricosa*.—Cap convex, then plane, smooth, becoming silky towards the edge, viscid when moist, shining when dry, white, up to 1 in. across; gills almost free, crowded, whitish, then brown; stem entirely covered with white down, not fibrillose, curved or wavy, about 1 in. long (spores elliptical,  $5-6 \times 3-3.5 \mu$ ).

Very variable in size, usually small. Superficially resembling *I. geophylla*, but generally smaller, and without cystidia.

On the ground, fallen chips, etc., in damp woods.

†† Stem coloured.

*I. mimica*.—Cap bell-shaped, obtusely umbonate, fibrillose, yellowish brown, everywhere covered with large, adpressed, darker fibrous scales, 2-3 in. across; gills deeply sinuate, broad, yellow-brown; stem solid, fibrillose, paler than the cap, 2-3 in. long (spores subcylindrical,  $14-16 \times 6-8 \mu$ ).

On the ground in woods.

*I. hirsuta*.—Cap conico-campanulate, then expanded and umbonate, with more or less spreading squamules, edge fimbriate, brownish or ochraceous brown, disc sometimes tinged green, up to 1 in. across; gills adnate, crowded, narrow, becoming dusky cinnamon, edge whitish, crenulate; stem brownish fibrillose, apex pale, floccose, base verdigris-green, 2-3 in. long (spores elongated, pip-shaped,  $11-14 \times 5-5.5 \mu$ ).

The flesh becomes tinged red when cut. *I. calamistrata* differs in the squarrosely squamulose stem. *I. hæmacta* differs in having cystidia, etc.

Damp places in woods, etc.

*I. calamistrata*.—Cap bell-shaped, dusky brown, completely clothed with recurved spreading scales,  $1-2\frac{1}{2}$  in. across; gills crowded, broad, white, then rusty, edge whitish and crenulate; stem rigid, tough, fuscous, dusky blue at the base,  $1\frac{1}{2}-2\frac{1}{2}$  in. long (spores elliptic-oblong, subreniform,  $11-13 \times 5-6 \mu$ ).

Smell strong, not unpleasant. Flesh tinged red when cut. Nearest to *I. hirsuta*, differing in the rusty gills and spreading scales on the stem.

On the ground in pine woods.

*I. echinata*.—Cap bell-shaped, then expanded, at first floccosely downy, then breaking up into scales, dusky or sooty brown when young, then dingy brownish yellow, about 1 in. across; gills crowded, almost or quite free, pink, then blood-red, finally with a brownish tinge; stem floccosely downy below the imperfect annular zone, dusky red, 1-2 in. long (spores elliptical, yellowish brown with a pink tinge,  $4-5 \times 2.5-3 \mu$ ).

On peat and soil in gardens and greenhouses.

*I. fastigiata*.—Cap conico-campanulate, gibbous or obtusely umbonate, sometimes acutely umbonate, fibrillose and slightly cracked, disc alone sometimes slightly squamulose, pale yellowish brown,



edge sometimes slightly wavy or lobed,  $1-2\frac{1}{2}$  in. across ; gills free, rather crowded, narrowish, yellowish, then dusky olive ; stem solid, minutely fibrillose, paler than the cap, 2-4 in. long (spores elliptical, sometimes slightly curved,  $8-11 \times 6-7 \mu$ ).

The principal features of this species are the yellowish brown cap, olive gills, smooth elliptical spores, and absence of cystidia.

On the ground in woods, etc.

*I. cookei*.—Cap conico-campanulate, then expanded and umbonate, edge at length splitting and upturned, silky and fibrillose, cracked, disc smooth, yellowish straw-colour to lurid yellowish, thin, 1-2 in. across ; gills crowded, adnexed, narrowed behind, yellowish cinnamon, edge paler and fimbriate ; stem equal, solid, the colour of the cap, base minutely marginately thickened, 2-3 in. long (cystidia absent ; spores smooth, elliptical or subreniform,  $8-10 \times 5-5.6 \mu$ ).

Superficially resembling *I. fastigiata*, which differs in having a whitish stem and olive gills.

First observed in this country in Mulgrave Woods, near Whitby, during the Y.N.U. Fungus Foray, September, 1910.

On the ground in woods.

*I. mimica*.—Cap campanulate, obtusely umbonate, fibrillose, yellowish brown, everywhere covered with large, adpressed, slightly darker coloured scales,  $2-3\frac{1}{2}$  in. across ; gills broad, deeply sinuate, and attached to the stem by a very narrow portion, yellowish brown ; stem solid, equal, fibrillose, paler than the cap,  $2-3\frac{1}{2}$  in. long, stout (spores subcylindrical, smooth,  $14-16 \times 6-8 \mu$ ).

The cap looks exactly like that of *Lepiota friesii*, only on a smaller scale.

On the ground in woods.

First found at the Y.N.U. Fungus Foray at Castle Howard, Yorks, 1902.

*I. rhodiola*.—Cap fleshy, campanulate, then expanded and umbonate, fibrillosely cracked, centre even, rufous chestnut or brownish flesh-colour,  $2-3\frac{1}{2}$  in. across ; gills crowded, sinuato-uncinate, almost free, edge fimbriate, white, then yellowish umber, often spotted with brownish umber ; stem fibrillosely squamulose, becoming smooth, vinous, apex pallid, subfloccose,  $2\frac{1}{2}-3\frac{1}{2}$  in. long, stout, stuffed (spores subreniform, smooth,  $10-12 \times 6-8 \mu$ , some  $14-15 \times 8 \mu$ ).

Smell resembling meal. There are numerous large clavate or subfusoid cells on the edge of the gills, but no true cystidia on the surface of the gills.

On the ground in pine woods.

#### HEBELOMA

Cap regular, cuticle smooth, more or less viscid, not scaly nor

fibrillose, edge incurved at first; gills sinuate, adnexed; stem central, fibrillose.

*Inocybe* differs in the cuticle of the cap being scaly or fibrillose.

\* *Stem white or whitish.*

*H. sinuosum*.—Cap 3–6 in. across, wavy, brick-red or yellowish red, edge crenulated; gills broad, crowded, becoming rusty; stem 4–6 in. long, fibrillosely striate, apex flocculose, white.

In woods.

*H. fastibile* (Pl. XXIV, fig. 4).—Cap 2–3 in. across, pale yellow tan, then paler; gills becoming cinnamon, edge paler; stem wholly fibrous, white, slightly bulbous, veil forming a more or less distinct ring-zone.

Differs from *H. crustuliniforme* by more distant gills and presence of ring. Smell strong, something like radishes.

In woods.

*H. senescens*.—Cap 2–4 in. across, ochraceous flesh-colour with a tinge of rust, rusty yellow when old, with the edge crisped and hoary; gills becoming dark rusty; stem 3–4 in. long, lower part brownish with concentric squamules, upper part persistently white.

In pine woods.

*H. glutinosum*.—Cap 2–3 in. across, soon plane, with a tough, glutinous film, yellowish white with white squamules; gills yellowish, then cinnamon; stem about 3 in. long, whitish with whitish squamules and fibrils, apex mealy.

Among dead leaves, twigs, etc. Smell peculiar, not unpleasant.

*H. testaceum*.—Cap 1–2 in. across, pale brick-red or ochraceous tan; gills crowded, narrow, rusty; stem about 3 in. long, somewhat bulbous, pallid, floccose.

Known amongst the viscid species by the almost free, closely crowded, narrow gills. Smell of radishes.

In woods.

*H. firmum*.—Cap 2–3 in. across, umbonate, brick-red; gills rusty, edge whitish, serrulate; stem 2–3 in. long, pale, darker below, covered everywhere with white, floccose scales.

On the ground in fir woods.

*H. claviceps*.—Cap 1–2 in. across, gibbous, pallid, disc darker; gills crowded, pallid, then dingy; stem about 2 in. long, everywhere covered with white meal, brownish below.

In woods.

*H. punctatum*.—Cap 1–2 in. across, soon plane, centre umber, remainder tan-colour, disc papillose; gills crowded, narrow, pallid; stem 2–4 in. long, often wavy, pale, apex mealy, rest silky.

In woods. Gregarious.



*H. versipelle*.—Cap about 3 in. across, glutinous, reddish tan, pale when dry; gills tan-colour; stem about 2 in. long, whitish silky, tip mealy.

Grassy places and among fir needles. Somewhat tufted.

*H. mesophæum*.—Cap 1–1½ in. across, yellowish or pallid, disc dark; gills crowded, rusty tan; stem 2–3 in. long, fibrillose, whitish, then rusty, apex mealy.

In pine woods. Gregarious.

*H. subcollariatum*.—Cap about 1 in. across, glutinous, pale ochraceous tan, centre darker; gills pale tan, edge whitish; stem about 2 in. long, often wavy, pale, pulverulent, base brownish.

On naked soil.

*H. sinapizans*.—Cap 3–6 in. across, soon plane, wavy, smooth, tan-colour; gills deeply emarginate, crowded, broad, cinnamon-tan; stem 3–5 in. long, white, fibrillose, apex squamulose.

Our largest species, suggesting *H. sinuosum*, but differing in the strong smell of radishes.

In woods.

*H. crustuliniforme*.—Cap 2½–3 in. across, soon plane, umbo broad, pallid tan-colour, disc darker; gills crowded, narrow, tan-colour, then bay; stem about 2 in. long, somewhat bulbous, white, smooth, apex with minute scales.

Smell unpleasant, resembling radishes.

In woods, meadows, etc.

*H. elatum*.—Cap 3–4 in. across, pale tan-colour; gills pale cinnamon; stem about 4 in. long, cylindrical, pallid white, apex mealy.

Smell very strong, like radishes.

In pine woods, among fallen leaves.

*H. subsaponaceum*.—Cap soon convexo-plane, orbicular, even, naked, dry, pallid yellowish red, deeper when dry, about 1–1½ in. across; gills adnate, breaking away from the stem, crowded, dry, becoming pale rusty; stem elongated, equal, generally slightly wavy, fibrillose, apex slightly mealy, pallid, base darker, 1–1½ in. long.

Smell strong, soapy. Allied to *H. elatum*, but differing in the soapy smell, smaller size, and in the stem not being twisted.

Among pine leaves. Gregarious.

*H. longicaudum*.—Cap 1½–2½ in. across, umbonate, becoming wavy, viscid, tan-colour, disc darker; gills pale cinnamon, edge serrulate; stem 4–5 in. long, white, apex mealy.

In woods. Smell weak, not unpleasant.

*H. lugens*.—Cap 2–3 in. across, fleshy, convex, then almost plane, smooth, slightly viscid, brown, then yellowish; gills almost free, fragile, crowded, pallid, then ferruginous, edge darker, crenulate;

stem 2–3 in. long, fibrillose striate, shining, somewhat bulbous, apex with white meal.

Smell strong, but not like radishes.

On the ground in woods.

*H. truncatum*.—Cap 2–3 in. across, wavy and very irregular, rufous ; gills crowded, rusty, edge entire ; stem only about 1 in long, stout, white.

Stem not truly fibrillose nor squamulose, in which it differs from all other species.

In woods.

*H. nudipes*.—Cap 2–3 in. across, tan-colour ; gills crowded, tan-colour ; stem about  $2\frac{1}{2}$  in. long, entirely fibrillose, white, smooth and quite naked above.

In woods.

*H. nauseosum*.—Cap 1– $1\frac{1}{2}$  in. across, viscid, ochrey white ; gills tan-colour, then rusty ; stem  $1\frac{1}{2}$ –2 in. long, whitish, mealy above, solid.

Odour very strong and abominable. Differs from *H. crustulini-forme* in the smooth stem.

On the ground in mixed woods.

*H. capnocephalum*.—Cap 1–2 in. across, dingy yellowish, edge becoming blackish ; gills broad, rusty ; stem  $1\frac{1}{2}$ –2 in. long, fibrillose striate with reddish fibrils, becoming pale.

On the ground.

*H. ischnostylum*.—Cap 1–2 in. across, broadly umbonate, white or a little pallid at the disc ; gills dingy tan, edge slightly serrate ; stem about 2 in. long, smooth, naked, whitish.

Differs from *H. nudipes* in the white cap.

\*\* *Stem not white.*

*H. musivum*.—Cap 2–5 in. across, viscid, becoming squamulose, edge often wavy, yellow, or disc darker, flesh thick, yellow ; gills pale yellow, then rusty ; stem 4–5 in. long, fibrillose, pale yellow, apex mealy.

Suggests *Flammula* or *Cortinarius*, differing in emarginate, polished (not powdery) gills and mealy apex of stem.

In pine woods.

*H. magnimamma*.—Cap up to 1 in. across, umbo large, brick-red, then pale ; gills pallid, then rusty ; stem smooth, pallid yellowish.

Among grass.

*H. petiginosum*.—Cap about  $\frac{3}{4}$  in. across, the gibbous disc brown, remainder yellowish, silkily hoary ; gills yellow, then olive-bay ; stem about  $1\frac{1}{2}$  in. long, sometimes wavy, with a reddish tinge, powdery.

On the ground in beech woods.

*H. strophosum*.—Cap soon plane, viscid, bay, edge white and silky, about 1 in. across ; gills adnexed, crowded, flesh-colour, then



dingy cinnamon; stem whitish, with an imperfect white, silky, apical ring,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long.

Our only *Hebeloma* where the veil forms a ring on the stem.  
On naked soil.

#### NAUCORIA

Cap regular, more or less fleshy, conical or convex, then expanded, edge at first incurved; gills never decurrent; stem central, cartilaginous or more or less polished.

Nearest to *Galera*, which differs in the edge of the cap being straight, and not incurved when young, and in the thinner, often striate cap.

1. *Pileus smooth* (not floccose nor squamulose).

\* *Gills adnexed or almost free.*

*N. lugubris*.—Cap  $1\frac{1}{2}$ –3 in. across, becoming wavy and gibbous, pallid, then rusty; gills free, broad, crowded, becoming rusty; stem 3–4 in. long, smooth, rooting, pallid, rusty below.

On the ground among grass, moss, etc.

*N. festiva*.—Cap convex, rather gibbous, even, glutinous, usually brownish olive, dirty pale ochraceous when dry, about 1 in. across; gills free, ventricose, crowded, pale, becoming ferruginous; stem 2–3 in. long, equal, narrowed and rooting at the base, smooth, even, usually whitish, but sometimes variously coloured, hollow.

A very fine species, but from the variable colours somewhat difficult to define. Gills whitish at first, then sometimes olive, or yellowish, or blood-red. Cap straw-colour, with an olive tinge when dry.

Among grass.

*N. arvalis*.—Cap up to 1 in. across, tough, rather thick, convex, then expanded, orbicular, obtuse, even, smooth, slightly viscid, yellowish brown, paler when dry; gills adnexed, rather distant, brownish white, then ferruginous; stem about  $1\frac{1}{2}$  in. long, even, pulverulent, yellowish, continued into a long rooting base.

Allied to *N. semiorbicularis*, but distinguished from this, and every other known species, by the long rooting base of the stem.

On the ground in cultivated fields, gardens, etc.

*N. hydrophila*.—Cap campanulate, then slightly expanded, acutely umbonate, smooth, striate when moist, pale ochraceous tan with a distinct tinge of green here and there, flesh very thin, greenish; gills adnexed, rather crowded, pallid, then brownish, edge pale; stem equal, wavy, smooth, even, with red and green tints, hollow,  $1\frac{1}{2}$ –2 in. long.

In swampy places, under trees.

*N. pediades*.—Cap 1–2 in. across, thin, convex, then plane, obtuse, sometimes slightly depressed, dry, becoming minutely rivulose, but never striate, yellowish ochraceous, then tan-colour; gills

adnexed, crowded at first, then rather distant, brownish, then dingy cinnamon ; stem 2–3 in. long, somewhat wavy, base slightly thickened, yellowish.

In pastures, etc.

*N. hamadryas*.—Cap  $1\frac{1}{2}$ –2 in. across, soon expanded and gibbous, rusty bay, yellowish when old and dry, gills crowded, rusty ; stem 2–3 in. long, fragile, smooth, pallid.

On the ground under trees. Hygrophanous.

*N. cidaris*.—Cap about 1 in. across, conical, then campanulate, slightly striate, wavy, cinnamon-tan ; gills crowded, honey-colour ; stem about  $1\frac{1}{2}$  in. long, blackish brown.

Stem often compressed and wavy.

On the ground in pine woods around trunks.

*N. cucumis*.—Cap  $\frac{2}{3}$ –1 in. across, broadly campanulate, bay-brown, tan when dry ; gills crowded, becoming saffron-colour ; stem firm, 1–2 in. long, bay or blackish brown.

Distinguished by the strong smell of cucumber.

On the ground among fragments of wood, sawdust, etc.

*N. anguinea*.—Cap  $1\frac{1}{2}$ –2 in. across, yellowish tan, when young with a silky zone near the edge ; gills crowded, yellow, then rusty ; stem 2–3 in. long, wavy, brownish, densely covered with white fibrils.

On the ground.

*N. horizontalis*.—Every part cinnamon-colour. Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across ; gills broad ; stem  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, incurved.

On trunks of elm, etc. Gregarious, growing horizontally.

*N. semiflexa*.—Cap up to  $\frac{1}{2}$  in. across, convexo-plane, chestnut-colour, edge white and silky ; gills brownish ; stem  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, incurved, pale.

On wood and on the ground. Gregarious.

*N. glandiformis*.—Cap about 1 in. high and broad, obtusely campanulate, nut-brown, smooth ; gills very broad, umber ; stem 3–4 in. long, equal, pallid.

Readily known by the very broad, rusty umber gills and campanulate cap.

On the ground.

*N. striæpes*.—Cap 1– $1\frac{1}{2}$  in. across, campanulate, then expanded, ochraceous ; gills tawny cinnamon ; stem 2–3 in. long, wavy, whitish, distinctly longitudinally striate.

Readily known by the ochraceous cap, and white, striate, wavy stem.

Among grass on lawns, in cultivated fields, etc.

*N. latissima*.—Cap  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across, hemispherical, deep chestnut-brown ; gills very broad, tawny umber ; stem  $1\frac{1}{2}$ –2 in. long,



narrowed downwards into a rooting base, dark brown below, smooth.

Differs from *N. arvalis* in the smooth, not powdered stem, and from *N. glandiformis* in the rooting stem.

Among grass.

\*\* *Gills adnate*.

*N. obtusa*.—Cap about 1 in. across, convex, rufous or orange-tawny, becoming pale; gills cinnamon, edge serrate; stem about 2 in. long, yellowish flesh-colour or pale cinnamon, darker inside.

Known by the broad, broadly adnate, serrate gills.

On the ground.

*N. centuncula*.—Cap  $\frac{1}{2}$ –1 in. across, often excentric, lurid greenish, then yellowish green, then pale; gills broadly adnate, but soon separating from the stem, greyish yellow, edge with greenish yellow down; stem about 1 in. long, usually curved, yellowish grey.

On rotten wood.

*N. abstrusa*.—Cap  $\frac{2}{3}$ –1 in. across, orbicular, viscid, rusty tan; gills crowded, pale rusty; stem 1–1 $\frac{1}{2}$  in. long, polished, rusty.

*N. melinoides* differs in the striate cap.

On leaf soil, sawdust, etc.

*N. innocua*.—Cap about 1 in. across, striate, reddish brown, then pale; gills narrow, ochraceous; stem about 1 in. long, paler than the cap, whitish fibrillose, base woolly.

On damp ground.

*N. cerodes*.—Cap  $\frac{2}{3}$ –1 $\frac{1}{2}$  in. across, soon expanded, hygrophanous, watery cinnamon, silky and wax-colour when dry; gills adnate, separating from the stem, broad, cinnamon; stem 1 $\frac{1}{2}$ –2 $\frac{1}{2}$  in. long, yellowish, base rusty.

Resembling *Galera hypnorum*, which differs in the umbonate cap, broader gills and longer stem.

Among grass, on burnt soil, etc.

*N. melinoides*.—Cap  $\frac{1}{2}$ –1 in. across, soon almost plane, tawny, then ochraceous, striate at edge when old; gills triangular-oblong, crowded, honey-colour; stem about 1 $\frac{1}{2}$  in. long, colour of cap, apex mealy.

Among grass on lawns, etc.

*N. pusiola*.—Cap about  $\frac{1}{2}$  in. across, yellow; gills broad, crowded, becoming cinnamon; stem about 1 in. long, smooth, shining, yellow.

Always small, known by the yellow cap and stem being slightly viscid.

Among grass, moss, etc.

*N. nucea*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, almost globose, umbilicate, edge

lobed, incurved, pale chestnut ; gills cinnamon ; stem about 3 in. long, white, silky.

On the ground amongst firs.

*N. badipes*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, slightly umbonate, yellowish rusty, pale tan when dry ; gills yellowish rust-colour ; stem 2–3 in. long, rusty, with white squamules half-way up.

Resembles a *Galera*, but distinguished by the squamules on the stem.

On the ground in damp places.

*N. scolecina*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, soon plane, edge slightly striate, rusty bay, edge paler ; gills becoming rusty, edge downy ; stem 2–3 in. long, wavy, reddish rust-colour, sprinkled with white meal.

On moist ground under alders, etc.

*N. sideroides*.—Cap  $\frac{1}{2}$ –1 in. across, umbonate, viscid, yellowish cinnamon, then shining and tan-colour ; gills crowded, pale ochre, then cinnamon ; stem 2–3 in. long, pallid, then yellowish, base rusty.

On trunks, chips, etc.

*N. camerina*.—Cap slightly fleshy, convexly campanulate, obtusely umbonate, even, smooth, edge striate, ochraceous tan, pale and opaque when dry, disc somewhat darker,  $\frac{1}{3}$ – $\frac{1}{2}$  in. across ; gills adnate, crowded, yellowish cinnamon ; stem wavy, hollow, equal, umber, adpressedly fibrillose, about 1 $\frac{1}{2}$  in. long.

On trunks, especially pine.

*N. temulenta* (Pl. XIX, fig. 3).—Cap  $\frac{2}{3}$ –1 in. across, thin, campanulate, then convex, subumbonate, edge slightly striate, smooth, ferruginous when moist, ochraceous when dry ; gills adnate, narrowed in front, rather distant, lurid, then ferruginous umber ; stem about 2 in. long, wavy, smooth and polished, apex slightly mealy.

Slender, cap somewhat umbonate, never depressed. Somewhat resembling *N. pediades*, but distinguished by the cap being striate at the edge when moist, and also in being umbonate.

In moist woods, etc.

*N. triscopoda*.—Cap up to  $\frac{1}{2}$  in. across, soon expanded, umbo prominent, bay, then ochraceous, always opaque ; gills dark rusty ; stem  $\frac{1}{2}$ –1 $\frac{1}{2}$  in. long, curved or wavy, rusty.

On old wood. Gregarious or scattered.

*N. vervacti*.—Cap about 1 in. across, slightly umbonate, viscid, shining when dry, pale yellow ; gills crowded, pallid, then rusty ; stem about 1 $\frac{1}{2}$  in. long, smooth, whitish, not rooting.

In meadows, gardens, etc.

*N. semiorbicularis*.—Cap 1–2 in. across, slightly viscid, rusty, ochraceous when dry ; gills very broad, crowded, pallid, then rusty ; stem 2–4 in. long, pale rusty, shining.

Allied to *N. pediades*, differing in the viscid cap and rusty stem.

Among short grass,



*N. tabacina*.—Cap  $\frac{1}{2}$ –1 in. across, almost plane, smooth, umber, then cinnamon; gills crowded, at length cinnamon-bay; stem 1–2 in. long, smooth, cinnamon.

All one colour, umber, when moist.

By waysides. Somewhat tufted.

*N. tenax*.—Cap  $\frac{1}{2}$ –1 in. across, soon expanded, viscid, hygrophanous, between pale cinnamon and olive, or brownish yellow, pale when dry; gills becoming rusty; stem 1–2 in. long, fibrillose, yellowish, then tinged brown or olive.

Among grass and on sticks.

*N. myosotis*.—Cap 1–2 in. across, convex, then expanded, sub-umbonate, covered with a viscid pellicle, olive or brownish green, becoming pale and yellowish, disc darker; gills adnato-decurrent, rather distant, at length rusty brown, edges serrulate, white; stem 3–6 in. long, equal, sometimes wavy, squamulose, or with dark fibrils, pallid, then brownish, apex powdered with white meal, hollow.

In damp localities, swamps, among *Sphagnum*, etc.

2. Cap squamulose or floccose; veil evident.

\* Scales of cap superficial, disappearing.

*N. porriginosa*.—Cap  $\frac{3}{4}$ –1 $\frac{1}{2}$  in. across, viscid, tawny, then pale, sprinkled with superficial saffron squamules; gills crowded, yellow, then tawny cinnamon; stem 2–3 in. long, silky, then smooth, pallid.

The largest and most beautiful species in the genus, readily known by the tawny orange cap, at first covered with yellow or saffron squamules.

Among twigs, etc.

*N. sobria*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, soon plane, slightly viscid, honey-colour, disc darker, pruinose towards the edge from the veil; gills crowded, broad, pale saffron-colour; stem about 1 $\frac{1}{2}$  in. long, pale above, rusty below, sprinkled with white, silky spots.

Among grass, etc.

\*\* Cap persistently squamulose.

*N. erinacea*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, umbilicate, rusty umber, scaly with erect tufts of fibrils; gills rusty brown; stem about  $\frac{1}{2}$  in. long, rusty brown, squamulose up to the apex.

Differs from *N. siparia* in squamulose stem up to the top, and umbilicate cap.

On dead branches.

*N. siparia*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, not umbilicate, reddish rusty, densely covered with fascicles of hairs resembling minute scales; gills colour of cap, edge downy; stem colour of cap, squamulose up to the ring, naked above.

On dead branches, fern stems, and on the ground.

*N. conspersa*.—Cap about  $\frac{1}{2}$  in. across, soon plane, soon broken up into scurfy squamules, cinnamon-bay, then pale ; gills crowded, cinnamon ; stem about 1 in. long, brownish cinnamon, apex scurfy.

On the ground amongst leaves, *Sphagnum*, etc.

*N. escharoides*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, scurfy or squamulose, tan-colour, then whitish, disc brownish ; gills pallid tan, then cinnamon ; stem 1–2 $\frac{1}{2}$  in. long, wavy, fibrillose, pallid, then brownish.

On naked ground. Gregarious or somewhat tufted.

*N. rimulincola*.—Cap about  $\frac{1}{2}$  in. across, convex, umbilicate, edge plicate, rugulosely tomentose, pale cinnamon ; gills adnexed, rather distant, thick, very broad in proportion, pale cinnamon ; stem more or less excentric, incurved, pale, solid, about  $\frac{1}{2}$  in. long.

Readily distinguished by the coarsely plicate cap, and the broad, distant, cinnamon gills.

On fallen twigs, etc.

\*\*\* *Cap not flocculose, silky or atomate.*

*N. carpophila*.—Cap 1–3 lines across, pale tan, then whitish, minutely scurfy with glistening particles ; gills broad, ochraceous, edge crenulate ; stem about  $\frac{1}{4}$  in. long, scurfy, then smooth, pallid.

On beech-nut husks, beech leaves, etc.

*N. graminicola*.—Cap 2–4 lines across, papillate, coarsely tomentose, brown, then pale ; gills pale ochre ; stem  $\frac{1}{2}$  in. long, tough, brownish, hairy.

On dead grass, twigs, etc.

#### GALERA

Cap regular, thin, conical or oval, then expanded, edge at first straight (not inturned) and pressed to the stem ; gills adnate or adnexed ; stem central, polished.

Most closely related to *Naucoria*, differing in the thin cap having the edge straight and pressed to the stem when young. Mostly slender, small, and fragile. Generally growing on the ground.

\* *Gills adnate.*

*G. tenera* (Pl. XIX, fig. 1).—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. high and broad, conico-campanulate, obtuse, hygrophanous, rusty when moist, pale and atomate when dry ; gills rather broad, cinnamon ; stem 3–4 in. long, straight, colour of cap.

Differs from *G. lateritia* in coloured stem and broad gills.

Among grass. Common.

*G. siliginea*.—Cap about  $\frac{1}{2}$  in. across, campanulate, then expanded, greyish, not becoming pale ; gills narrow, ochraceous ; stem 2–3 in. long, rather wavy, pallid.

Edge of cap often wavy.

Under ferns, etc., in damp places.

*G. campanulata*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. broad and high, campanulate, sub-acute, hygrophanous, deep cinnamon when moist, wrinkled, almost



white and atomate when dry ; gills tawny cinnamon ; stem about 2 in. long, wavy, pallid.

Cap and stem become nearly or quite white when dry. Smell strong.

On road scrapings and dry places by roadsides, etc.

*G. sparteæ*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, campanulate, then expanded, hygrophanous, rusty, pale tan when dry ; gills crowded, dark cinnamon ; stem 1–2 in. long, polished cinnamon.

Smaller than *G. tenera*, and the cap is more expanded.

Among grass, moss, etc.

*G. vittæformis*.—Cap  $\frac{1}{2}$ –1 in. across, conical, then hemispherical, edge striate, bay when moist ; gills rather distant, becoming rusty ; stem  $1\frac{1}{2}$ –3 in. long, reddish.

On the ground among moss, etc.

*G. rubiginosa*.—Cap  $\frac{1}{4}$ – $\frac{1}{2}$  in. across, campanulate, everywhere striate, honey-colour, then pale, gills distant, ochraceous ; stem about 2 in. long, shining, bay.

Among moss, etc.

*G. hypnorum*.—Cap up to  $\frac{1}{2}$  in. across, campanulate, then convex, often with a papillate umbo, finely striate, yellowish ochre or watery cinnamon, paler when dry ; gills broad, distant, tawny cinnamon ; stem about 2 in. long, wavy, tawny or yellowish.

Small, slender, form variable.

Among moss, etc.

var. *Sphagnum*.—Three to four times the size of the typical form, cap up to 1 in. across ; stem longer, fibrillose.

Among *Sphagnum*.

var. *bryorum*.—Larger than the type, cap watery cinnamon, papillate.

Among moss.

*G. mniophila*.—Cap about  $\frac{2}{3}$  in. high,  $\frac{1}{2}$  in. across, campanulate, somewhat papillate, striate, yellowish brown ; gills broad, distant, ochraceous ; stem 2–3 in. long, slightly wavy, yellow, rather stout.

Among moss.

*G. minuta*.—Cap 1–2 lines across, campanulate, striate, pale tawny bistre ; gills as broad as long, crowded, yellowish, then tan ; stem  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, hair-like, tawny.

On decayed wood.

\*\* *Gills adnexed or almost free.*

*G. lateritia*.—Cap 1 in. or more high, cylindrical, then campanulate or conical, hygrophanous, pale yellowish, paler when dry ; gills very narrow, crowded, rusty ; stem 3–4 in. long, straight, whitish, mealy.

Allied to *G. ovalis*, differing in the narrow, ascending gills.

In rich pastures, etc.

*G. ovalis*.—Cap 1 in. high,  $1\frac{1}{2}$  in. across, ovate-campanulate, hygrophanous, rusty, then yellowish ; gills broad, crowded, rusty ; stem 3–4 in. long, straight, colour of the cap.

Differs from *G. tenera* in its larger size, and from *G. lateritia* in its coloured stem.

On dung and among grass.

*G. antipoda*.—Cap  $\frac{1}{2}$ –1 in. across, campanulato-convex, disc slightly prominent and fleshy, ochre, almost white and atomate when dry ; gills narrow, yellowish ochre ; stem about 1 in. long, rather swollen at the base, rooting, pale ochraceous.

Known by the long, tapering rooting base of the stem.

On dung and on the ground.

*G. conferta*.—Densely crowded. Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, conico-campanulate, striate, fuscous, then ochraceous ; gills ochraceous brown ; stem 1–2 in. long, shining, whitish.

In stoves. Rare.

*G. pygmæo-affinis*.—Cap 1– $1\frac{1}{2}$  in. across, soon expanded, wrinkled, brownish or honey-colour tan ; gills crowded, very narrow ; stem 2–3 in. long, white.

Among grass, etc.

*G. ravida*.—Cap  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across, campanulate, then hemispherical, hygrophanous, greyish, edge fringed with the veil ; gills nearly free, broad, yellowish ; stem about  $1\frac{1}{2}$  in. long, silvery shining, with a tinge of yellow.

On rotten wood or on the ground among chips, etc.

*G. mycenopsis*.—Cap up to  $\frac{3}{4}$  in. across, soon expanded, striate to the middle, pale ochre, white and silky near the edge at first ; gills broad, rather distant, pale ochre ; stem 3–4 in. long, with a white silkiness.

In marshy ground amongst *Sphagnum*.

*G. sahleri*.—Minute. Cap membranaceous, conical, acute, striate, tawny chestnut, honey-colour when dry, with fugacious silky fibrils at the edge, about 1 line broad ; gills adnate, pale yellow, then tawny ochre ; stem slender, fragile, fibrillose, shining, about  $\frac{1}{4}$  in. long.

On oak trunks, etc.

*G. spicula*.—Cap very thin, up to  $\frac{1}{2}$  in. across, conico-campanulate, then expanded, brownish ochre, smooth, hygrophanous, striate when moist, flocculose and atomate when dry ; gills adnate ; stem about 1 in. long, white and densely covered with white squamules.

Readily known by its small size, and white, floccose stem.

On cocoanut fibre.

#### TUBARIA

Cap regular, thin ; gills more or less decurrent, broadest behind ; stem central, cartilaginous, hollow ; spores rusty.



Small fungi, known by the more or less decurrent, almost triangular gills.

*T. furfuracea* (Pl. XIX, fig. 6).—Cap  $\frac{1}{3}$ –2 in. across, becoming depressed, yellowish cinnamon, hygrophanous, paler when dry, hoary and silky-squamulose; gills adnato-decurrent, cinnamon; stem 1–2 in. long, paler than cap, minutely flocculose.

Distinguished by the minutely scurfy cap.

On twigs, chips, etc.

*T. paludosa*.—Cap  $\frac{1}{4}$ – $\frac{3}{4}$  in. across, thin, conical, then convex, with a papillate umbo, yellowish brown; gills slightly decurrent, very broad behind, ochraceous; stem 3–4 in. long, wavy, flocculose, ochraceous.

Distinguished by the papillate umbo.

In swamps among *Sphagnum*, etc.

*T. stagnina* (Pl. XIX, fig. 5).—Cap  $\frac{1}{2}$ –1 in. across, thin, conical, then convex, sometimes depressed, slightly viscid and striate when moist, rusty bay, pale and with squamules near the edge when dry; gills broad, triangular, rusty; stem 4–7 in. long, reddish bay.

In swamps amongst *Sphagnum*.

*T. pellucida*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, thin, soon plane and umbonate, cinnamon, pale and squamulose when dry; gills triangular, pale cinnamon; stem 1–1 $\frac{1}{2}$  in. long, pale, shining.

Amongst leaves, etc.

*T. muscorum*.—Cap up to  $\frac{1}{2}$  in. across, depressed, striate, smooth, yellow-brown; gills horizontal; stem short, colour of cap.

Amongst moss on the trunks of trees.

*T. embolus*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, finely striate, yellowish tawny, paler when dry; gills triangular, very distant; stem 1 $\frac{1}{2}$ –2 in. long, tawny yellow, shining yellow when dry.

On damp, heathy ground.

Resembling *Omphalia umbellifera* in general appearance, differing in the cinnamon gills.

*T. crobula*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, slightly viscid, even, with whitish floccose scales, then naked and tan-colour; gills rusty brown; stem 1–1 $\frac{1}{2}$  in. long, wavy, brownish with white floccose scales.

Among fallen branches, sticks, etc.

*T. inquilina*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, striate, livid brown, tan when dry; gills very broad behind, triangular, brownish, then umber; stem about 1 in. long, bay at first with white fibrils.

Differs from *T. crobula* in the striate cap.

On twigs, chips, etc.

*T. cupularis*.—Cap up to 1 in. across, plano-depressed, even, smooth, rufescent, then yellow, hygrophanous; gills slightly decurrent, narrow, crowded, dingy cinnamon; stem 2–3 in. long, slightly thinner upwards, whitish, hollow.

Resembling an *Omphalia* in habit, but with rusty spores. A variety of this species has a tawny stem.

Among grass, etc.

*T. antochthona*.—Cap  $\frac{1}{4}$ –1 in. across, hemispherical, obtuse, silky, thin, ochraceous white, edge flocculose; gills adnate, with a decurrent tooth, honey-colour; stem  $\frac{3}{4}$ –1 in. long, wavy or curved, base whitish, woolly.

This species does not become pallid on drying, like *T. furfuracea*, but is of an ochraceous white tint from the first. Spores also paler than in the last-named species.

On naked soil.

#### FLAMMULA

Cap regular, fleshy, edge incurved at first; gills decurrent or adnate (not sinuate); stem central, fibrous, veil fibrillose, not forming a distinct ring.

Closely allied to *Pholiota*, which differs in having a distinct ring on the stem. Most grow on wood.

1. *Gills decurrent*.

*F. gymnopodia*.—Cap 2–3 in. across, convex, rusty brown, squamulose; gills very decurrent, crowded; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, rusty, often incurved.

On the ground, on pine sawdust, etc. Often tufted.

*F. aldridgea*.—Cap 1–2 in. across, funnel-shaped, tawny orange, velvety; gills deeply decurrent, crowded; stem 3–4 in. long, smooth, colour of cap.

On the ground amongst moss.

*F. vinosa*.—Cap 1– $1\frac{1}{2}$  in. across, depressed, minutely flocculose, rusty cinnamon with purple tinge; gills crowded, decurrent, yellowish, then rusty; stem about 1 in. long, pale, flocculose.

On the ground.

*F. mixta*.—Cap 1–2 in. across, obtuse, viscid, dingy tan, disc darker and wrinkled; gills slightly decurrent, crowded; stem 1–3 in. long, curved, with yellow-brown squamules.

On the ground, in pine woods more especially.

*F. juncina*.—Cap 1– $1\frac{1}{2}$  in. across, sulphur-yellow, disc brown; gills decurrent, sulphur-yellow, then brownish; stem sulphur-yellow, 3–4 in. long.

On old dead rushes. Taste bitter and nauseous.

*F. fusus*.—Cap 2– $3\frac{1}{2}$  in. across, soon plane or depressed, viscid, reddish tan, disc darker; gills slightly decurrent, yellow, then rusty; stem about 2 in. long, and then gradually narrowed into a long rooting base, pallid, fibrillose.

On fallen wood and on the ground. Often tufted.

*F. decipiens*.—Cap about 1 in. across, convex, obtuse or umbonate, dry, minutely squamulose, clear brown, becoming pale and



the disc almost white, flesh thick, golden yellow ; gills decurrent, crowded, orange-brown ; stem about  $1\frac{1}{2}$  in. long, rich tawny, striate, often twisted.

Ring absent. Superficially closely resembling *F. carbonaria*, differing in the decurrent, bright-coloured gills.

On burnt earth, charcoal, etc. Inclined to be fasciculate. Flesh of stem brown at the base.

*F. lupina*.—Cap 3–4 in. across, convex, then flattened and sometimes more or less depressed, even, viscid, brown or tawny ; gills adnato-decurrent, rather crowded, broad, pallid, then clay-colour ; stem about 1 in. long, stout, firm, unequal, with adpressed fibrils, tinged tawny, apex white.

Among grass.

*F. helomorpha*.—Cap  $\frac{1}{2}$ –1 in. across, rather fleshy, convex, then expanded, unequal, gibbous, viscid, edge incurved, white ; gills adnato-decurrent, crowded, white, then tan-colour ; stem about 1 in. long, unequal, curved, ascending, almost smooth, whitish, solid ; veil absent.

Cap often obtusely umbonate. *F. scamba*, its nearest ally, is distinguished by the flocculose stem, which eventually assumes a tawny tinge.

On the ground in pine woods. Scattered.

2. *Gills adnate, or adnate with just a decurrent tooth.*

† *Cap viscid.*

*F. lenta*.—Cap 2–3 in. across, whitish, dingy or livid, at first with white squamules ; gills whitish, then stained rusty ; stem 2–3 in. long, often viscid, with white recurved squamules.

Very glutinous in wet weather. Altogether whitish or pale clay-colour.

On the ground, rarely on wood.

*F. lubrica*.—Cap 2–4 in. across, tawny red or bright cinnamon ; gills adnate, just a little decurrent, crowded, clay-colour ; stem 2–5 in. long, fibrillose, whitish.

On or near trunks.

*F. gummosa*.—Cap  $1-2\frac{1}{2}$  in. across, pale yellow, often with a greenish tinge, then tinged rusty, with superficial squamules ; gills crowded, narrow, yellowish, then cinnamon ; stem 2–3 in. long, fibrillose, pale above, base rusty.

On and about old stumps.

*F. spumosa*.—Cap 1–2 in. across, pale yellow, disc with a rufous tinge ; gills crowded, pale yellow, then rusty ; stem 2–4 in. long, colour of cap.

In pine woods on the ground. Clustered. Very viscid in wet weather.

*F. carbonaria*.—Cap 1–2 in. across, tawny yellow ; gills crowded, pale, then brownish ; stem  $1\frac{1}{2}$ –3 in. long, rigid, pallid, fibrillose squamulose.

On burnt earth, charcoal, etc. Gregarious.

*F. alnicola*.—Cap 2–3 in. across, rather slimy at first, yellow, then tinged tawny or greenish ; gills slightly adnate, yellow, then rusty ; stem 2–4 in. long, curved or wavy, fibrillose, yellow, then stained rusty.

Smell strong, very acrid.

On trunks and stumps, especially alder. Clustered.

*F. connisans*.—Cap 1–3 in. across, slightly viscid, pale yellow, centre tinged tawny ; gills adnate, with a decurrent tooth, crowded, pallid, then brownish ; stem 2–3 in. long, often flattened and twisted, yellowish white.

Veil often remaining in shreds at the edge of the cap.

On willow trunks, etc. Densely tufted.

*F. inopoda*.—Cap 1–4 in. across, slightly viscid, honey-coloured, tan or with a reddish tinge, edge paler ; gills thin, crowded, yellowish, often tinged green ; stem 3–6 in. long, wavy, long rooting, pale above, brownish below.

On fallen pine trunks. Tufted or gregarious.

*F. scamba*.—Cap 1– $1\frac{1}{2}$  in. across, becoming plane or depressed, viscid in wet weather, downy, dingy white ; gills adnato-decurrent, crowded, yellowish clay-colour ; stem 1– $1\frac{1}{2}$  in. long, incurved, flocculose, white.

In pine woods, on fallen trunks and on the ground.

†† *Cap not viscid*. (May be moist in damp weather.)

*F. floccifera*.—Cap about 2 in. across, tawny, somewhat zoned in drying, sprinkled with white fibrils ; gills rounded behind, adnate, rusty, edge white ; stem  $1\frac{1}{2}$  in. high, white with silky scales.

On stumps of lime, etc.

*F. filia*.—Cap 2–3 in. across, soon plane, pale reddish yellow, disc tawny, whitish, then tawny yellow ; stem 4–6 in. long, smooth, pale yellow.

On the ground in woods.

*F. astragalina*.—Cap 1– $2\frac{1}{2}$  in. across, orange-saffron, edge pale ; gills yellow, then rusty ; stem 2–4 in. long, wavy, pale yellow or tinged red.

One of the most beautiful species in the genus. Cap when moist often blood-red, verging into saffron.

On pine and fir stumps.

*F. flavida*.—Cap 1–3 in. across, pale yellow ; gills pale yellow, then rusty ; stem 2–4 in. long, rather wavy, fibrillose, pale yellow ; veil in fragments from the edge of the cap.

On trunks. Tufted.



*F. inaurata*.—Whole fungus sulphur-yellow. Cap up to 1 in. across; gills adnate, with a decurrent tooth; stem about 1 in. long, incurved.

On willow trunks.

*F. apicrea*.—Cap  $1\frac{1}{2}$ –3 in. across, convex, then becoming almost plane, thin, smooth, moist, dingy orange, disc darker, edge often splitting; gills adnate, crowded, shining ferruginous; stem 2–3 in. long, not rooting, pallid, fibrillose, rusty downwards, as are also the fibrils, hollow.

Very similar to *F. alnicola*, but the colour of the gills is almost unchangeable, flesh hygrophanous, and sweet smell distinguishes it.

On rotten trunks. Rather tufted.

*F. carnos*a.—Tufted in habit. Cap soon expanded, very fleshy and broadly gibbous, edge remaining more or less incurved for some time, even, smooth, dull tawny orange, flesh yellowish, compact,  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, flesh  $\frac{1}{2}$  in. or more thick at the disc, thin at the extreme edge; gills somewhat crowded, thin, slightly decurrent, rust-coloured, powdered with the spores; stem about equal, solid, fibrous, colour of the cap, 2–3 in. long.

Remarkable for the very fleshy cap, the thickness of which appears to be out of proportion to the rest of the fungus. Entirely dull tawny orange. Spores elliptical, smooth, brown,  $7 \times 5 \mu$ . This species has not previously been described; it was found by Mr. A. Clarke at the Y.N.U. Fungus Foray at Castle Howard, 1909.

Growing on wood in small clusters.

*F. hybrida*.—Cap about 2 in. across, hemispherical, then expanded, edge incurved, symmetrical, smooth, even, moist, tawny cinnamon, then rich tawny orange, flesh thin, tawny; gills adnate, yellowish, then tawny ferruginous; stem 2–3 in. long, usually narrowed upwards, downy, then silky, rather striate, whitish with silky down, but tawny orange when the down disappears, ring present as a white annular zone near the apex of the stem.

On stumps and on the ground, growing on roots, fragments of wood, etc.

*F. sapinea*.—Cap 1–3 in. across, fleshy, compact, hemispherical, then expanded, very obtuse, slightly flocculoso-squamulose, then usually cracked into minute scales, dry, tawny orange, edge paler; gills adnate, crowded, plane, yellow, then bright rusty orange; stem 1–2 in. long, stout, often irregular, rooting, yellowish, turning brownish when bruised.

Smell strong. The yellowish veil scarcely evident.

On pine wood.

*F. liquiritiæ*.—Cap 1–3 in. across, becoming almost plane and rather umbonate, bay-brown or tawny orange, then pale; gills

broad, golden yellow, then cinnamon ; stem about 2 in. long, often curved, fibrous, rusty with a white silkiness.

Taste like that of liquorice.

On fir trunks. Somewhat tufted.

*P. picrea*.—Cap about 1 in. across, tawny bay or brownish cinnamon, then pale and tawny ; gills crowded, yellowish, then rusty ; stem 2–3 in. long, straight, pale umber.

On pine stumps, old deal boards, etc. Rather tufted.

*F. nitens*.—Cap 1–1½ in. across, obtuse, dry, shining, purple-brown ; gills pallid, then umber ; stem 2–3 in. long, pinkish brown.

On the ground. Tufted.

*F. ochrochlora*.—Cap 1–2 in. across, obtusely umbonate, minutely squamulose, greenish straw-colour, then pale ; gills whitish, then greenish olive ; stem about 2 in. long, often curved and wavy, scaly, whitish above.

Stature and habit of *Hypholoma fasciculare*, but differs in the clear, rusty spores.

On old trunks, furze roots, etc.

*F. clitopila*.—Cap 1–1¾ in. across, convex, then expanded, disc depressed and umbilicate, smooth, dry, purplish brown ; gills slightly adnexed, ventricose, dingy yellowish ; stem about 2 in. long, ventricose, smoky brown, with a few scattered fibrils towards the base, hollow, brown inside.

On the ground under firs.

*F. purpurata*.—Cap 1–2 in. across, fleshy, convex, then expanded, obtusely umbonate, clad with persistent, minute, small squamules, dry, purple or purple-brown, not becoming pale ; gills adnate, lemon-yellow, then very deep and bright rust-colour, narrow ; stem 1–2 in. long, curved, ascending, solid, smooth, pallid above, purplish and granular downwards, ring imperfect, fibrillose.

Taste very bitter. Flesh of cap thick, becoming tinged with violet or purple.

On old tree-fern stems. Probably an introduced species.

*F. filicea*.—Cap ⅔–1½ in. across, thin, convex, then plane or slightly depressed, minutely squamuloso-fibrillose, deep yellow, disc tawny orange ; gills adnate, crowded, sulphur-yellow, then tawny cinnamon ; stem 1½–2 in. long, equal, even, almost smooth, sulphur-yellow, base often tawny, hollow.

Remarkable for the sulphur-yellow colour of every part, the flesh also.

On old tree-fern stems. Probably an introduced species.

#### CORTINARIUS

Cap symmetrical ; gills usually adnexed or adnate, spores rust-colour in the mass ; stem central ; secondary veil cobweb-like or



silky-fibrillose, never forming a distinct interwoven ring on the stem, but frequently remaining as a silky or fibrillose zone.

A very natural genus, but difficult to define in words. The cobweb-like veil and rust-coloured gills and spores are the most pronounced characters. Most nearly allied to *Flammula*, which differs in the species growing on wood, and the decurrent gills. All the species of *Cortinarius* grow on the ground. The genus is divided into the following sub-genera :

Cap viscid or glutinous, stem firm, dry.

*Phlegmacium*.

Cap and stem both viscid.

*Myxadium*.

Not viscid nor hygrophanous, cap everywhere equally fleshy (not becoming markedly thinner towards the edge) ; cap at first squamulose ; stem fleshy, rather bulbous.

*Inoloma*.

Not viscid nor hygrophanous, flesh of cap thin and equal ; stem equal or narrowed.

*Dermocybe*.

Hygrophanous, not viscid, flesh of cap either thin throughout, or when thick at the disc becoming suddenly thin ; stem either with one or more ring zones, or scaly (peronate) up to the ring zone.

*Telamonia*.

Hygrophanous, not viscid, flesh of cap quite thin ; cap smooth or covered with white fibrils ; stem not peronate.

*Hygrocybe*.

### *Phlegmacium*

\* *Gills pale, then tan-colour.*

*C. triumphans*.—Cap 3–5 in. across, viscid, yellow, at first with dusky squamules ; gills crowded ; stem 3–6 in. long, clavate, whitish, solid, with several tawny ring-like zones.

In woods under birch, etc. Rare.

*C. claricolor*.—Cap 3–5 in. across, smooth, yellow ; gills crowded, white at first ; stem about 3 in. long, white, sometimes bulbous, squamulose up to the ring.

The cuticle of the cap often becomes cracked into minute scales. On the ground amongst birch, heather, etc.

*C. turmalis*.—Cap 2–4 in. across, smooth, viscid, dingy yellowish tan, disc darker ; gills broad ; stem 3–6 in. long, stout, hard, whitish.

Among dead beech leaves, etc. Usually densely clustered.

*C. crassus*.—Cap 3–5 in. across, dingy yellow, disc glabrous, remainder with innate fibrils ; gills narrow, crowded ; stem 3–4 in. long, whitish, apex with white meal.

In moist woods.

*C. balteatus*.—Cap 3–4 in. across, flattened, viscid, shining when dry, disc bay, margin lilac, which soon disappears ; gills broad in front, crowded ; stem  $1\frac{1}{2}$ –2 in. long, solid, stout, whitish, fibrillose, veil rusty.

In mixed woods.

*C. sebaceus*.—Cap  $2\frac{1}{2}$ –5 in. across, viscid, colour of suet, then pale, mealy at first ; gills emarginate ; stem 3–4 in. long, solid, stout, not bulbous, pallid.

In mixed woods.

*C. lustratus*.—Cap 1–2 in. across, pallid ; gills closely crowded, narrow ; stem 1–2 in. long, smooth, whitish.

Among grass in sunny places.

*C. multiformis*.—Cap 2–3 in. across, yellow, tan or tawny ; gills thin, crowded ; stem 2–4 in. long, bulbous, whitish.

In woods.

*C. napsus*.—Cap 2–3 in. across, smoke-colour, then tawny bay ; gills broad, smoky white ; stem about 2 in. long, bulb obconic, which is obliquely marginate, white.

Allied to *C. rapaceus*, but distinct in the broad, crisped, rather distant smoky white gills.

In pine woods, etc.

*C. allutus*.—Cap about 1 in. across, reddish russet, edge darker ; gills adnate, edge crenulate ; stem about 1 in. long, viscid, white, marginately bulbous.

Cap sometimes orange-yellow, disc paler when moist, deep yellow when dry ; gills sometimes decurrent.

In pine woods.

*C. talus*.—Cap 2–3 in. across, dingy yellowish, then pale, edge tinged yellowish olive ; gills straw-colour, then discoloured ; stem about 3 in. long, pallid, bulb marginate.

In woods.

*C. cumatilis*.—Cap 3–4 in. across, disc brownish, remainder dingy lilac, covered with violet gluten ; gills crowded, narrow edge serrate ; stem about 3 in. long, somewhat bulbous, whitish.

In copses, etc.

*C. serarius*.—Cap 3–4 in. across, reddish tan ; gills adnexed, with a decurrent tooth ; stem 3–4 in. long, shining white.

In woods.

*C. emollitus*.—Cap 3–4 in. across, tawny, ochraceous and shining when dry ; gills broad ; stem  $1\frac{1}{2}$ –2 in. long, scarcely bulbous, white tinged yellow.

Among grass in beech woods. Often tufted.

*C. cristallinus*.—Cap about 3 in. across, disc pallid, edge silvery white, entirely whitish when dry ; gills crowded ; stem about 3 in. long, hollow, pale straw-colour.

In woods amongst leaves. Taste acrid.

*C. decoloratus*.—Cap 2–4 in. across, tan-colour, becoming wrinkled ; gills slightly crowded ; stem about 3 in. long, silvery shining.

In beech woods.



## PLATE XXII

- |    |             |              |
|----|-------------|--------------|
| 1. | CORTINARIUS | ELATIOR      |
| 2. | „           | MUCIFLUUS    |
| 3. | „           | LARGUS       |
| 4. | „           | STILLATITIUS |
| 5. | „           | FULGENS      |



PLATE XXII.





\*\* *Gills violet or purplish at first, then cinnamon.*

*C. varius*.—Cap 2–3 in. across, tawny rust-colour ; gills rather crowded ; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, stout, white, bulb not marginate.

*C. cyanopus*.—Cap 2–3 in. across, livid bay or tawny brown ; gills broad, rather crowded ; stem about 2 in. long, violet, then whitish, bulb obliquely depressed, not marginate.

In woods.

*C. variicolor*.—Cap 4–5 in. across, reddish, the downy edge violet ; gills crowded ; stem 4–5 in. long, bulbous, blue, then whitish.

In pine woods.

*C. largus* (Pl. XXII, fig. 3).—Cap 4–6 in. across, tan-colour or tawny brick-red ; gills adnate, edge irregular ; stem 3–4 in. long, clavate, lilac.

In pine woods.

*C. glaucopus*.—Cap 3–4 in. across, becoming floccose or squamulose, olive-bay, soon tawny yellow ; gills broad ; stem 2–3 in. long, striate, blue, then pallid yellow.

In pine woods. Tufted.

*C. calochrous*.—Cap about 2 in. across, tawny, yellowish towards the edge ; gills crowded, edge serrate ; stem  $1\frac{1}{2}$ –2 in. long, equal with an abrupt marginate bulb, yellowish, no trace of blue.

In woods, especially beech.

*C. cœrulescens*.—Cap 2–3 in. across, dingy yellow, varying to yellowish brown ; gills closely crowded, narrow ; stem about 2 in. long, bulb often disappearing with age, bright violet, then pale or whitish.

Among moss, etc., in woods.

*C. purpurascens*.—Cap 4–5 in. across, bay or reddish, then tawny olive, edge marked with a raised brown line when expanded, wavy ; gills crowded, violet-purple when bruised ; stem about 3 in. long, bulbous, clear blue, purplish blue when bruised, bulb somewhat marginate.

In pine woods.

*C. decolorans*.—Cap  $1\frac{1}{2}$ –3 in. long, persistently yellow all over ; gills sinuately adnexed ; stem 2–3 in. long, white, smooth, not at all bulbous.

In pine woods.

*C. porphyropus*.—Cap  $1\frac{1}{2}$ –3 in. across, white flesh, becoming purplish lilac when broken ; livid yellowish or tan-colour ; gills rather crowded ; stem 2–4 in. long, lilac-violet outside and inside, then pale.

In woods.

*C. riederi*.—Cap 2–3 in. across, thin, campanulate, then expanded, ochraceous, shining when dry ; gills adnate, rather thick, edge irregular, lilac, then cinnamon ; stem 3–4 in. long, clavate, silky-fibrillose, lilac.



Cap often obtusely umbonate. Although technically a *Phlegmacium*, its affinities are with *Myxacium* from a structural point of view.

In pine woods.

*C. croceocæruleus*.—Cap  $\frac{3}{4}$ – $1\frac{1}{2}$  in. across, lilac or pale violet; gills lilac, then saffron-tan; stem about 2 in. long, hollow, equal, white.

Under beeches.

\*\*\* *Gills yellow, then cinnamon or rusty.* (Not whitish nor with a violet tinge at first).

*C. saginus*.—Cap 4–5 in. across, wavy, yellow; gills decurrent; stem about 3 in. long, stout, somewhat bulbous, yellowish.

In pine woods, etc.

*C. russus*.—Cap 3–4 in. across, coppery rufous; gills adnate, broad, rusty rufous; stem about 3 in. long, pallid.

In damp woods.

*C. dibaphus*.—Cap 3–4 in. across, purplish, disc becoming yellowish and at length variegated with lilac, flesh yellow with a violet line under the cuticle, gills crowded, rusty purple; stem about 3 in. long, marginately bulbous, yellow, apex purplish, flesh yellow.

In woods.

var. *xanthophyllus*.—Gills at first and for a long time clear yellow.

*C. turbinatus*.—Cap 2–4 in. across, dingy yellow or greenish; gills broad, crowded; stem cylindrical with a marginate bulb, yellowish.

Distinguished among allies by the regular, hygrophanous cap, quite entire dingy rusty ochre gills, without a trace of blue or purple-colour.

In beech woods.

*C. corrosus*.—Cap 2–3 in. across, becoming umbilicate, rusty, then pale tan; gills crowded, narrow; stem  $1$ – $1\frac{1}{2}$  in. long, with a marginate bulb, white.

In pine woods.

*C. fulgens* (Pl. XXII, fig. 5).—Cap 2–3 in. across, persistently tawny orange; gills bright yellow, then rusty; stem about 3 in. long, bulb depressed, marginate, fibrillose, yellow.

In woods.

*C. fulmineus*.—Cap  $1\frac{1}{2}$ –2 in. across, tawny, edge orange, with small, rusty scales; gills crowded, at first pure yellow; stem about 1 in. long, with a large marginate bulb.

In shady woods.

*C. orichalceus*.—Cap 2–4 in. across, reddish tawny, disc darker, cracked into squamules; gills broad, greenish sulphur-colour; stem 2–3 in. long, with a marginate bulb, yellowish.

Under pine trees.

*C. testaceus*.—Cap 3–4 in. across, brick-red with a tinge of purple ; gills broad ; stem 3–4 in. long, bulb somewhat marginate, whitish with a rufous tinge below.

On the ground.

*C. corruscans*.—Cap 3–5 in. across, yellowish ochre ; gills adnate, narrow ; stem 3–6 in. long, fibrillose, pure white.

Cap regular, often ochraceous and spotted with tawny.

Under bushes, etc.

*C. papulosus*.—Cap  $2\frac{1}{2}$ – $3\frac{1}{2}$  in. across, honey-colour or tan, disc darker ; gills adnato-decurrent, then separating from the stem, crowded ; stem about 3 in. long, fibrillose, white.

In pine woods.

\*\*\*\* *Gills olivaceous or greenish.*

*C. infractus*.—Cap about 3 in. across, olive, then yellowish with a brownish ridge near the edge ; gills olive-umber ; stem about 3 in. long, ovately bulbous, olive, becoming pale.

In beech woods, etc.

*C. anfractus*.—Cap 2–3 in. across, dark olive, then tawny soot-colour ; gills distant, smoky olive ; stem 2–3 in. long, fibrillose, dingy, apex violet.

In woods.

*C. berkeleyi*.—Cap 3–6 in. across, brown, centre darkest, edge tinged lilac and wrinkled ; gills cinnamon with an olive tinge at first ; stem 4–6 in. long, base bulbous, silky-fibrillose, white.

In woods.

*C. prasinus*.—Cap 2–3 in. across, dingy bluish green ; gills rather distant ; stem about 2 in. long, marginately bulbous, pale green, no violet.

In beech woods.

*C. atrovirens*.—Cap 3–4 in. across, dark green or olive-umber ; gills adnate, crowded ; stem about 3 in. long, bulb turbinate, marginate, bluish green.

In pine woods.

*C. scaurus*.—Cap  $1\frac{1}{2}$ –3 in. across, smoky tawny, spotted, then pale ; gills very narrow, olive or sometimes purplish ; stem about 3 in. long, with a marginate bulb, tinged green or blue.

In woods.

*C. herpeticus*.—Cap  $1\frac{1}{2}$ –3 in. across, olive, then dingy tan ; gills closely crowded, smoky violet ; stem 2–3 in. long, bulb napiform, marginate, scarcely tinged violet.

In woods.



## MYXACIUM

\* *Gills at first whitish, ochraceous or cinnamon (never violet).*

*C. arvinaceus*.—Cap 3–4 in. across, wavy, golden tawny or reddish tan ; gills very broad, finally ochraceous ; stem 5–8 in. high, silky white.

In beech woods.

*C. collinitus*.—Cap 3–5 in. across, tawny orange ; gills adnate, becoming ochraceous ; stem 3–5 in. high, transversely scaly, white, rarely tinged blue.

In woods amongst heather, etc.

*C. mucifluus* (Pl. XXII, fig. 2).—Cap  $1\frac{1}{2}$ –3 in. across, edge striate, yellowish ; gills adnate, at length cinnamon ; stem 2–3 in. long, white, floccose up to the veil, smooth above.

In sandy and heathy pine woods.

*C. elatior* (Pl. XXII, fig. 1).—Cap 3–4 in. across, coarsely radiately wrinkled, livid yellow, then dingy ochre ; gills adnate, broad, always dark cinnamon-brown ; stem 5–7 in. long, white, slightly narrowed at each end, rarely tinged violet.

Cap somewhat variable in colour, livid bay, ochraceous or tan, blackish bay, brownish violet, greyish with the edge tinged violet, etc. Recognized by the long, more or less fusiform stem.

In woods, especially pine.

*C. grallipes*.—Cap about 3 in. across, rusty, then ochraceous tan ; gills adnate, with a decurrent tooth, rusty ; stem 4–6 in. long, wavy, tawny yellow.

In mixed woods.

*C. livido-ochraceous*.—Cap 1– $1\frac{1}{2}$  in. across, ochraceous ; gills pale cinnamon ; stem about 1 in. long, narrowed at each end, whitish.

In woods.

*M. nitidus*.—Cap 2–5 in. across, honey-colour, then whitish ; gills truly decurrent at every stage ; stem 2–4 in. long, clavate, whitish and fibrillose, becoming naked and yellowish.

In beech woods. Somewhat tufted.

*C. stillatitius* (Pl. XXII, fig. 4).—Cap  $1\frac{1}{2}$ –2 in. across, covered at first, as is also the stem, with clear blue gluten, livid fuscous, then greyish white ; gills dark cinnamon ; stem 2–3 in. long.

Somewhat resembling *C. elatior*, but smaller, and stem not floccose.

Among moss in pastures, etc.

*C. vibratilis*.—Cap about  $2\frac{1}{2}$  in. across, golden yellow ; gills ochraceous cinnamon ; stem 2–4 in. long, snow-white.

In woods.

*C. pluvius*.—Cap  $\frac{1}{2}$ –1 in. across, tawny yellow, ochraceous when dry ; gills becoming ochraceous ; stem up to 3 in. long, naked, white.  
In pine woods, etc.

\*\* *Gills at first violet, blue or reddish.*

*C. delibutus*.—Cap 2–3 in. across, yellowish ; gills adnate, bluish violet, then cinnamon ; stem 2–4 in. long, yellowish white when dry.  
Among grass in woods, etc.

*C. salor*.—Cap about 2 in. across, grey, edge bright violet ; gills adnate, distant ; stem  $1\frac{1}{2}$ –2 in. long, conically attenuated from the bulbous base, white.

In woods, etc.

*C. illibatus*.—Cap 1–2 in. across, subumbonate, yellow, disc darker ; gills adnato-decurrent, flesh-colour, then tan ; stem about 3 in. long, white.

No trace of violet colour anywhere.

In pine woods.

#### INOLOMA

\* *Gills white or pallid at first (not tinged violet).*

*C. argentatus*.—Cap 3–4 in. across, becoming broadly gibbous, silvery grey and shining ; gills crowded, edge serrulate ; stem 3–4 in. long, solid, silvery white.

In woods.

*C. opimus*.—Cap 3–4 in. across, everywhere covered with short ochraceous down ; gills narrow, rather crowded ; stem about 1 in. long, stout, solid, base rooting, whitish.

Distinguished by the very short, thick stem, and the very thick, hard flesh of the cap.

On the ground in woods.

*C. turgidus*.—Cap 2–3 in. across, hoary and sprinkled with shining particles, smooth and silvery shining when adult ; gills crowded, edge entire ; stem 2–3 in. long, stout, bulbous, smooth, silvery white.

Allied to *C. argentatus*, differing in unbroken edge of gills.

\*\* *Gills, stem and veil becoming more or less coloured violet.*

*C. violaceus* (Pl. XXIII, fig. 4).—Cap very fleshy, 3–6 in. across, dark violet, covered with persistent down ; gills blackish violet, becoming rusty ; stem 3–4 in. long, bulbous, dark violet, veil woolly, bluish, then rusty.

Easily recognized by being dark violet, both outside and inside, the downy-squamulose cap and distant gills.

In woods.

*C. cyanites*.—Cap 3–4 in. across, violet with a reddish tinge, edge whitish fibrillose ; gills rather crowded, purple, broad ; stem about 3 in. long, purplish violet, bulbous.

In larch woods, etc.



## PLATE XXIII

- |    |             |             |
|----|-------------|-------------|
| 1. | CORTINARIUS | ARMILLATUS  |
| 2. | „           | SANGUINEUS  |
| 3. | „           | DOLABRATUS  |
| 4. | „           | VIOLACEUS   |
| 5. | „           | CINNAMOMEUS |
| 6. | „           | RIGIDUS     |



PLATE XXIII.





*C. alboviolaceus*.—Cap 2–3 in. across, umbonate or gibbous, whitish violet, silky ; gills greyish violet, then cinnamon ; stem about 2 in. long, clavately bulbous, whitish violet outside and inside.

In beech woods, etc., among fallen leaves.

*C. malachius*.—Cap about 2 in. across, pale lilac, then rusty brown, paler when dry, hoary ; gills crowded, purple, then rusty ; stem 3–4 in. long, bulbous, bluish lilac, then whitish, veil sometimes peronate, but the stem is usually naked. A perfect membranaceous ring sometimes present.

In fir woods.

*C. camphoratus*.—Cap 2–3 in. across, silky and lilac, then almost smooth and whitish or yellowish, flesh blue ; gills deep sky-blue, then purplish ; stem 3–5 in. long, bulbous, woolly-peronate when young, bluish, violet inside.

Smell foetid, penetrating.

In pine woods, etc.

*C. hircinus*.—Cap about 2 in. across, with adpressed violet fibrils, becoming rusty ; gills broad, violet, then cinnamon ; stem bulbous, violet, then pallid.

In fir woods. Exceedingly foetid, goat-like odour.

\*\*\* *Gills and veil cinnamon, red or ochraceous.*

*C. traganus*.—Cap about 3 in. across, purple-lilac, soon pale, then almost glabrous and yellowish ; gills saffron-ochre, then cinnamon ; stem 3–5 in. long, stout, bulb large, villose, violet, then whitish, inside deep saffron-ochre.

Readily known by the foetid odour and saffron-ochre gills.

In pine woods.

*C. suillus*.—Cap 3–4 in. across, pallid brick-red, squamulose ; gills adnate, broad, cinnamon ; stem 3–4 in. long, clavately bulbous, pallid, apex with a fleeting violet shade.

In pine woods.

*C. tophaceus*.—Cap 3–4 in. across, fleshy, convex, then expanded, obtuse, tawny ochraceous, villosely scaly, flesh white ; gills emarginate, distant, tawny cinnamon ; stem 2–3 in. long, more than 1 in. thick at the bulbous base, villosely scaly, yellowish, as is also the veil.

Solitary specimens often large. When tufted the specimens are more slender, stem often twisted. Differs from *C. redemitus* in the very obtuse cap and bulbous stem. This species is said to be sometimes wholly golden yellow.

In beech woods, etc.

*C. redemitus*.—Cap 2–3 in. across, thin, convex, then expanded, at length broadly gibbous, golden yellow, deepest and rather tawny at the disc, variegated with darker adpressed, fibrillose squamules ;



gills emarginate, rather distant, tawny cinnamon ; stem about 2 in. long, up to  $\frac{3}{4}$  in. at the thickened base, fibrillosely striate, yellowish ; veil whitish, forming a cinnamon indistinct zone on the stem.

Differs from *C. tophaceous* in the stem not being bulbous, but only slightly thickened at the base, and in not being villosely scaly.

In woods.

*C. callisteus*.—Cap about 2 in. across, tawny yellow, minutely squamulose ; gills broadly adnate, tawny yellow ; stem 3–5 in. long, clavato-bulbous, rhubarb-colour without and within.

In pine woods ; smell none.

*C. bulliardi*.—Cap 1–3 in. across, squamulose, rufescent ; gills rusty purple, edge whitish ; stem 2–3 in. long, bulb with vermilion fibres, pale.

In woods. Strong-smelling. Readily known by the vermilion bulb.

*C. vinosus*.—Cap 2–3 in. across, vinous red, shining ; gills rusty cinnamon ; stem 2–3 in. long, base marginately bulbous and reddish, upper part pale reddish.

Distinguished by the purplish red cap and distinctly marginate bulb. Under trees.

*C. bolaris*.—Cap 1–2 in. across, rather umbonate, reddish yellow, then pale, sprinkled with small saffron-red squamules ; gills crowded, soft, watery cinnamon ; stem 2–3 in. long, often wavy, squamose, coloured like the cap.

In beech woods. Sometimes slightly tufted.

\*\*\*\* *Gills or veil dark brown or olive.*

*C. pholideus*.—Cap 2–4 in. across, obtusely umbonate, brownish, when dry fawn-colour, and densely covered with erect brown squamules ; gills broad, lilac, then dingy cinnamon ; stem 3–4 in. long, shining, with numerous brown squamules below the ring, apex tinged lilac.

Easily known by the squamulose cap and stem.

In woods.

*C. sublanatus*.—Cap 3–4 in. across, umbonate, fawn-colour, then rusty with innate brownish squamules ; gills yellowish olive, then cinnamon ; stem about 3 in. long, conical or clavately bulbous, downy-squamulose and brownish up to the middle, tinged violet above.

Smell strong like radishes.

In fir woods, etc.

*C. phrygianus*.—Cap 2–3 in. across, honey-colour, densely covered with black fibrils ; gills dingy yellow ; stem somewhat bulbous, paler than the cap, whitish when dry, with black filaments forming a lax network.

Habit almost that of *Armillaria mellea*. Smell like radishes.

In damp beech woods, etc.

*C. arenatus*.—Cap 2–3 in. across, light red, then pale brown, with granulated scales ; gills yellowish cinnamon ; stem about 3 in. long, with brown scales up to the middle.

In woods.

*C. penicillatus*.—Cap 1–1½ in. across, obtusely umbonate, rusty brown, tawny when dry, densely floccosely squamose with darker scales ; gills obscure brown ; stem 2–3 in. long, with concentric rusty brown scales up to the apex.

In pine woods, etc.

### *Dermocybe*

\* *Gills at first whitish or pallid.*

*C. ochroleucus*.—Cap 2–3 in. across, whitish with a tinge of ochre, smooth ; gills nearly free, becoming ochraceous tan ; stem 2–3 in. long, whitish, fibrillose above.

In woods. Common.

*C. decumbens*.—Cap 1–1½ in. across, smooth, white or yellowish, shining ; gills white, then tan-colour ; stem 1–2 in. long, curved and ascending, white, smooth, base clavato-bulbous.

Small, firm, known by the ascending stem.

In woods and grassy places.

*C. riculatus*.—Cap 2–3 in. across, honey-colour, edge silky or floccose ; gills crowded, finally rusty ; stem 2–3 in. long, pallid white, veil very evident.

In pine woods.

*C. tabularis*.—Cap 3–4 in. across, broadly gibbous, at length quite flat, brownish tan, then paler ; gills crowded, becoming tan-colour ; stem 2–3 in. long, sometimes floccose, sometimes smooth, whitish.

In woods.

*C. camarus*.—Cap 2–3 in. across, umbo broad, often oblique, hoary brown, then tan or yellowish ; gills greyish tan, then brownish ; stem about 3 in. long, twisted or ascending from a curved base, white.

In woods. Tufted. Very fragile.

*C. diabolicus*.—Cap 1–1½ in. across, cracking, brownish with a grey bloom, then smooth and yellowish brown ; gills pale grey, then tan-colour ; stem about 3 in. long, pale, apex grey.

In beech woods, etc.

\*\* *Gills at first violet, becoming purple.*

*C. caninus*.—Cap 3–4 in. across, flattened, hoary and silky at the edge when young, then smooth, colour variable, brown, rufous brick-red, tawny when dry ; gills grey or purplish, then cinnamon ; stem 2–3 in. long, slightly bulbous, whitish with a white silkiness.

Differs from *C. anomalus* in the smooth stem.

In woods.



*C. myrtilinus*.—Cap 2–3 in. across, soon flattened, smoke-colour, never rufescent, silky-hoary ; gills amethyst-blue, never purple ; stem about 2 in. long, slightly bulbous, whitish, silky, apex violet.

Colour and habit of *Tricholoma nudum*.

In beech woods and near trunks.

*C. azureus*.—Cap 2–3 in. across, soon plane, hoary lilac, with a silky sheen ; gills bright bluish violet ; stem 2–3 in. long, sky-blue, then pale.

Among leaves and moss in woods.

*C. albocyaneus*.—Cap  $1\frac{1}{2}$ –2 in. across, with a silky pellicle, then smooth, white, then yellowish ; gills bluish purple, then ochraceous ; stem 3–4 in. long, somewhat clavate, whitish.

Differs from *C. alboviolaceus* in the smooth stem, and from *C. anomalus* in the somewhat club-shaped stem, flattened cap, and broader, at length ochraceous gills.

In beech woods, etc.

*C. anomalus*.—Cap 1–2 in. across, convex, then expanded and gibbous, smoky with a rufous tinge, hoary, then yellowish ; gills tinged violet or greyish purple, then cinnamon ; stem 2–3 in. long, rather squamulose and whitish, violet above.

In woods.

*C. spilomeus*.—Cap about 1 in. across, rufous or tan-colour ; gills crowded, narrow, grey or violet, then cinnamon ; stem about 2 in. long, whitish lilac variegated with rufous scales, apex white.

Differs from *C. anomalus* in the scaly stem.

In woods. Commonly tufted.

*C. lepidopus*.—Cap  $1-2\frac{1}{2}$  in. across, gibbous, umber with a tinge of violet near the edge, disc rufescent ; gills violet, then cinnamon ; stem 3–4 in. long, narrowed upwards, dingy white with darker fibrillose bands, apex violet, often wavy.

Heathy ground in woods. Gregarious or tufted.

\*\*\* *Gills at first bright cinnamon, red or yellow.*

*C. miltinus*.—Cap  $1\frac{1}{2}$ –2 in. across, polished, dark cinnamon, then disc bay, rest brick-red, shining, tan when dry ; gills very narrow, crowded, rusty ; stem 2–3 in. long, tough, cinnamon or reddish with red fibrils.

In woods. Smell none.

*C. cinnabarinus*.—Every part crimson-lake with a tinge of vermillion. Cap  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, silky-shining ; gills broad, with an olive tinge ; stem 1–2 in. long, silky.

Differs from *C. sanguineus* in smell, and broad gills with olive tinge.

In woods. Smell strong of radishes.

*C. sanguineus* (Pl. XXIII, fig. 2).—Cap 1–2 in. across, often wavy,

silky or squamulose, dark blood-red ; gills crowded, dark blood-red ; stem  $1\frac{1}{2}$ –2 in. long, dark blood-red.

In woods.

*C. anthracinus*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, umbonate, silky, chestnut-colour ; gills scarlet, blood-red when bruised ; stem about 2 in. long, blood-red.

In woods.

*C. cinnamomeus* (Pl. XXIII, fig. 5).—Cap  $1$ – $2\frac{1}{2}$  in. across, umbonate, cinnamon with silky yellowish fibrils ; gills broad, crowded, shining, yellow, then tawny yellow ; stem 2–4 in. long, yellow.

In woods.

var. *croceus*.—Smaller than type. Cap, gills, and stem often tinged olive.

var. *semisanguineus*.—Cap tawny ; stem yellow ; gills narrow, blood-red or orange-brown with a red tinge.

*C. croceoconus*.—Cap  $1$ –2 in. across, thin, conical, then campanulate, persistently acute, almost smooth, tawny cinnamon ; gills adnexed, ascending, narrow, crowded, cinnamon ; stem 2–3 in. long, wavy, hollow.

Allied to *C. cinnamomeus*, differs in the hollow, wavy stem, persistently acute cap, and very narrow gills.

On the ground. Gregarious or subcæspitose.

*C. uliginosus*.—Cap  $\frac{2}{3}$ –1 in. across, strongly umbonate, bright red-brown ; gills yellow, then olive, finally cinnamon ; stem 2–4 in. long, wavy, paler than the cap.

Boggy woods among *Sphagnum*.

*C. orellanus*.—Cap  $1\frac{1}{2}$ –2 in. across, obtusely umbonate, downy or fibrillose, golden tawny ; gills tawny cinnamon ; stem  $1\frac{1}{2}$ –2 in. long, fibrillose, tawny.

Differs from *C. cinnamomeus* in the striato-fibrillose stem, which is solid and tawny.

On the ground in woods.

*C. malicorius*.—Cap  $1$ –2 in. across, fibrillosely velvety, golden tawny ; gills golden tawny ; stem about 2 in. long, fibrillose, golden.

Differs from *C. cinnamomeus* in hollow stem and obtuse (not umbonate) cap.

In pine woods.

*C. infucatus*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, bright yellow ; gills tawny, then cinnamon ; stem 3–5 in. long, base clavate, fibrillose, whitish tinged yellow.

On the ground in woods.

\*\*\*\* Gills olivaceous ; cap not scaly.

*C. cotoneus*.—Cap about 3 in. across, covered with clear olive



down ; gills adnate, but soon separating from the stem, olive, then cinnamon ; stem about 3 in. long, fibrillose, pale olive.

In woods.

*C. subnotatus*.—Cap 3–4 in. across, olive, then fuscous ; gills yellowish, then olivaceous cinnamon ; stem 3–4 in. long, conical, squamulose with the yellowish fibrils of the veil.

In beech woods.

*C. raphanoides*.—Cap 1–2 in. across, silky, brownish olive, then tawny and smooth ; gills tinged olive, then somewhat rusty, edge paler ; stem 2–3 in. long, narrowed upwards, fibrillose, pallid.

Smell strong of radishes. Taste acrid.

In birch and beech woods.

*C. valgus*.—Cap about 3 in. across, pale olive, then expanded, sub umbonate and yellowish brown, pale brick-red when dry ; gills yellowish, then cinnamon ; stem 3–6 in. long, bulbous at base, twisted, pallid, shining, apex tinged violet.

Among moss in pine woods.

*C. venetus*.—Cap 1½–2 in. across, with persistent velvety down, green, then greenish yellow, more yellow when dry ; gills very broad, dark olive ; stem 2–3 in. long, equal, a little paler than the cap ; ring-zone fibrillose, green.

In woods.

#### *Telamonia*

1. *Gills very broad, rather thick, more or less distant ; stem spongy or entirely fibrous.*

\* *Stem and veil white or whitish.*

*C. macropus*.—Cap about 3 in. across, soon expanded, squamulose, then almost smooth, brick-red, then rusty ; gills pallid, then watery cinnamon ; stem 3–6 in. long, fibrillose, dingy white, then coloured like the cap, veil forming a narrow, interwoven white ring.

In damp woods.

*C. laniger*.—Cap about 3 in. across, with whitish squamules, then almost smooth, tawny ; gills tawny saffron, then shining tawny ; stem 2–4 in. long, peronate from the white veil up to the white, distinct ring.

In mossy pine woods. Strong scented.

*C. bivellus*.—Cap 1½–3 in. across, glabrous, reddish tawny ; gills clear tawny cinnamon ; stem about 3 in. long, somewhat bulbous, dirty white, floccosely squamulose up to the spurious fugacious ring.

In woods, etc.

*C. bulbosus*.—Cap about 3 in. across, soon expanded, smooth or squamulose near the edge, bay, then brownish tan ; gills first dark, then brownish cinnamon, no violet tinge ; stem 2–3 in. long, bulbous, paler than the cap, vaguely peronate and imperfectly ringed.

In woods amongst moss. Smells like radishes.

*C. urbicus*.—Cap  $1\frac{1}{2}$ –2 in. across, glabrous, whitish tan ; gills pale rusty ; stem about 2 in. long, equal, pallid, peronate up to the white ring.

Differs from *C. bivelus* in glabrous and paler coloured cap.

In grassy places.

*C. licinipes*.—Cap 2–3 in. across, expanded and obtusely umbonate, usually depressed round the umbo, glabrous, yellowish, then pale tan ; gills watery cinnamon ; stem 4–5 in. long, often wavy, whitish with white plumose squamules up to the membranaceous ring, becoming naked.

In fir woods, in damp places amongst *Sphagnum*, etc.

*C. microcylus*.—Cap  $1$ – $1\frac{1}{2}$  in. across, soon expanded, minutely umbonate, reddish brown, pale when dry ; gills lilac, then dark cinnamon ; stem  $1$ –2 in. long, white or pallid, veil collapsed into a white zone round the stem.

Allied to *C. decipiens*, differing in the somewhat bulbous stem and white zone on the stem.

In pine woods.

\*\* *Stem and gills violet.*

*C. torvus*.—Cap 2–4 in. across, expanded, at first hoary with minute squamules, then smooth, bay, brownish or coppery brown ; gills violet, then purplish umber, finally dark cinnamon ; stem 3–5 in. long, whitish and peronate up to the white spreading ring.

Stem at first bulbous, then elongated and equal ; ring evident, subpersistent ; stem usually bored by larvæ.

In woods, especially beech.

*C. impennis*.—Cap  $1\frac{1}{2}$ –2 in. across, brick-red, then pale ; gills violet, soon purplish, then cinnamon ; stem 2–3 in. long, rather bulbous, pallid, the imperfect ring and apex violet.

In pine woods, etc.

*C. lucorum*.—Cap  $1\frac{1}{2}$ –2 in. across, gibbous, wavy, bay with a tinge of brick-red ; gills cinnamon with a transient violet tinge ; stem about 2 in. long, slightly clavate, very fibrillose, pallid, with a white zone.

On the ground in woods.

*C. plumiger*.—Cap 2–3 in. across, conical, then campanulate, umbo broad, prominent, densely covered with white, floccose, erect scales, brown with an olive tinge, reddish tan when dry ; gills violet, then cinnamon ; stem 3–4 in. long, clavate, floccosely scaly, ring imperfect, pale.

In woods.

*C. scutulatus*.—Cap about 1 in. across, purple-umber, then brick-red ; gills purple-violet ; stem 3–4 in. long, somewhat bulbous, peronate and more or less ringed, dark violet outside and inside.

In damp woods. Smells like radishes.



*C. evernius*.—Cap 2–4 in. across, covered with a white, fibrillose, silky veil, purple-bay, very hygrophanous, brick-red, ochraceous when dry ; gills purplish violet, then cinnamon ; stem 3–6 in. long, equal or narrowed below, violet, then pale, indistinctly annulate from the veil.

In damp pine woods. Gregarious or somewhat tufted.

*C. quadricolor*.—Cap 2–3 in. across, umbonate, smooth, pale yellow, then tawny ; gills dark violet, then purplish cinnamon, edge white, serrulate ; stem about 3 in. long, wavy, fibrillose, with an oblique white zone that soon disappears.

In beech woods, etc.

\*\*\* Stem and veil red or yellow ; gills tawny or cinnamon, not violet nor brown.

*C. helvolus*.—Cap 2–3 in. across, smooth, rusty, yellowish when dry ; gills tawny cinnamon ; stem 3–4 in. long, pale rusty outside and inside, with a rusty ring-like zone.

In wooded pastures, etc.

*C. armillatus* (Pl. XXIII, fig. 1).—Cap 3–4 in. across, brownish brick-red, paler when dry ; gills pale, then dark cinnamon ; stem 4–5 in. long, bulbous or conical, fibrillose, pale with several oblique red zones.

In woods.

*C. hæmatochelis*.—Cap 3–4 in. across, gibbous, brownish brick-red, paler when dry ; gills pale cinnamon ; stem 4–5 in. long, somewhat bulbous, pallid, with a single oblique red zone.

Differs from *C. armillatus* in having only one red zone on the stem.

In woods.

*C. croceofulvus*.—Cap 2–4 in. across, bright tawny orange ; gills rusty ; stem 3–4 in. long, yellow with a rufous tinge, with a rufous orange zone, flesh like that of the cap, yellow.

In woods.

*C. limonius*.—Cap 2–4 in. across, tawny citron, ochraceous when dry ; gills yellow, then cinnamon ; stem about 3 in. long, floccosely squamulose, base deep saffron.

In pine woods.

*C. hinnuleus*.—Cap  $1\frac{1}{2}$ –2 in. across, tawny cinnamon ; gills tawny cinnamon ; stem 3–4 in. long, tawny, with a whitish ring-like zone.

In woods, etc.

*C. gentilis*.—Cap  $\frac{1}{2}$ –1 in. across, acutely umbonate, tawny cinnamon, yellow when dry ; gills very distant, cinnamon ; stem 3–4 in. long, often curved, tawny cinnamon, yellow when dry, ring floccosely squamulose, sometimes several zones are present.

In pine woods. Gregarious.

*C. helvelloides*.—Cap  $\frac{1}{2}$ –1 in. across, rusty, cracked and squarrose when mature, and then tawny ; gills violet-umber, edge whitish,

then rusty ; stem 2-3 in. long, wavy, rusty, veil yellowish, and an imperfect ring near apex of stem, above which it is silky white and shining.

In beech woods among damp, rotten leaves.

*C. rubellus*.—Cap 2-3 in. across, rufous orange ; gills pale, then bright rusty red ; stem 3-4 in. long, pale above, darker below, with concentric, rusty zones.

Differs from *C. armillatus* in brighter coloured cap and rusty, not clear red zones on the stem.

In swampy places.

\*\*\*\* *Stem becoming brownish ; veil brownish ; gills dark.*

*C. bovinus*.—Cap 3-5 in. across, watery cinnamon, tawny when dry ; gills cinnamon, then dark ; stem about 3 in. long, stout, base very bulbous, brownish cinnamon with a single brown zone, whitish above.

In pine and mixed woods.

*C. nitrosus*.—Stinking. Cap 2-3 in. across, fawn-colour or tawny, soon with concentric, darker scales ; gills violet, then watery cinnamon ; stem 2-3 in. long, ochraceous with concentric, darker squamulose bands.

Known by strong nitrous smell and banded stem.

In mixed woods.

*C. brunneus*.—Cap 3-4 in. across, umber, dingy reddish tan when dry ; gills purple-cinnamon, then umber-cinnamon ; stem about 4 in. long, clavate, brownish with dense white striations and with a brownish-white ring-like zone.

In pine woods.

*C. brunneofulvus*.—Cap about 2 in. across, tawny cinnamon, gills tawny cinnamon ; stem 3-4 in. long, pale tawny with a whitish, evanescent zone.

Differs from *C. brunneus* in tawny cinnamon cap.

In pine woods among moss, etc.

*C. injucundus*.—Cap 3-4 in. across, compact, convex, then plane obtuse, fuscous cinnamon ; gills emarginate, very broad, lilac-tan ; stem 3-4 in. long, stout, clavate and narrowed upwards, colour of the cap, then tawny yellow, solid.

In fir woods.

*C. glandicolor*.—Cap  $\frac{1}{2}$ -1 in. across, obtusely umbonate, umber or brown, paler when dry ; gills very distant, colour of the cap ; stem 3-5 in. long, colour of the cap, with a white, evanescent ring.

Among moss in pine woods, etc.

*C. punctatus*.—Cap  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. across, hoary, umber, tan when dry, punctate ; gills very distant, brownish ; stem 2-3 in. long, undulate, pale brown below, whitish above.

In woods, especially beech.



2. *Gills narrow, thin, more or less crowded.*

\* *Stem whitish, not floccosely scaly.*

*C. triformis*.—Cap 2–4 in. across, somewhat umbonate, brownish or yellowish, paler when dry; gills yellowish honey-colour, then cinnamon; stem about 3 in. long, clavate or somewhat bulbous, pallid, ring white.

Common in pine and mixed woods.

*C. biformis*.—Cap  $1\frac{1}{2}$ –3 in. across, acutely umbonate, rusty brown, pale bay and shining when dry; gills pale cinnamon, edge crenulated; stem 2–4 in. long, distinctly striate, paler than the cap, ring evident, oblique, whitish.

In mixed woods.

\*\* *Stem becoming violet.*

*C. periscelis*.—Cap 1–2 in. across, umbonate, lilac with a white silkiness; gills broadly adnate, dark rusty; stem about 4 in. long, lilac, with indistinct brownish zone, often several zones present.

In swamps under trees, etc.

*C. flexipes*.—Cap  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across, acutely umbonate, fibrillosely hoary, then naked, dark bay-brown with violet tinge, then pale, torn; gills purple, then cinnamon, edge whitish; stem 3–4 in. long, wavy, floccosely squamulose up to the white ring, violet.

In pine and other woods.

*C. flabellus*.—Cap  $\frac{2}{3}$ –1 in. across, obtusely umbonate, at first with white superficial scales, olive-brown, then tan-colour and torn into fibrils; gills dark olive, then rusty; stem 3–4 in. long, wavy, white, and scaly up to the ring, apex violet.

In damp places. Smell strong of radishes.

\*\*\* *Stem and cap tawny or rusty.*

*C. psammocephalus*.—Every part tawny cinnamon, same inside, becoming pale and rather golden when dry. Cap about 1 in. across, soon plane, then umbonate and edge upturned; gills sinuato-adnate; stem  $1$ – $1\frac{1}{2}$  in. long, squamulosely peronate.

In pine woods.

*C. iliopodius*.—Cap 1–2 in. across, rather umbonate, cinnamon, then tan; gills adnate, cinnamon; stem 3–4 in. long, wavy, tawny, sheathed up to the ring with the white, silky veil.

In woods.

*C. incisus*.—Cap  $\frac{1}{2}$ – $\frac{1}{3}$  in. across, umbonate, fibrillose or squamulose, hygrophanous, rusty, then tawny; gills rusty cinnamon; stem about 1 in. long, rusty, veil white, forming a ring or obsolete.

In pine woods, meadows, etc.

\*\*\*\* *Stem floccosely scaly, and, like the cap, becoming dusky.*

*C. hemitrichus*.—Cap 2–3 in. across, umbonate, densely covered near the edge with silky fibrils, brown; gills tan, then cinnamon;

stem  $1\frac{1}{2}$ –2 in. long, pale brown, floccosely squamulose up to the ring.

Among moss, fallen leaves, etc.

*C. stemmatus*.—Cap about 1 in. across, bay, fibrillose; gills crowded, bay; stem about 3 in. long, rusty bay, floccose up to the indistinct ring.

In damp woods.

*C. rigidus* (Pl. XXIII, fig. 6).—Cap  $1\frac{1}{2}$ –2 in. across, umbonate, smooth, bay, paler when dry; gills cinnamon; stem 2–4 in. long, wavy, colour of cap, not floccose.

In damp woods. Smell strong.

*C. paleaceus*.—Cap  $\frac{2}{3}$ –1 in. across, umbonate, silky white, squamulose, then smooth and brown; gills broad, cinnamon; stem about 3 in. long, brown outside and inside, with white squamules.

Damp places in beech woods.

*C. iris*.—Cap about 1 in. across, acutely umbonate, pale ochraceous brown, densely covered with white fibrils, edge splitting; gills becoming bright orange-brown; stem  $2\frac{1}{2}$ –3 in. long, conical, orange-brown below the bright brown ring, with fibrillose squamules of the same colour, above the ring violet, then pale.

Differs from *C. paleaceus* in the conical, straight stem.

On the ground in woods.

*C. cookei*.—Cap up to  $\frac{1}{2}$  in. across, tawny yellow, covered with a paler, shining woolly veil, umbonate, fibrillose; gills violet, then rusty; stem  $1\frac{1}{2}$ –2 in. long, wavy, pale, with several yellowish zones.

In woods.

### *Hygrocybe*

1. Cap rather fleshy, convex or campanulato-convex, then expanded, obtuse or at length gibbous, edge at first incurved; stem (in most instances) narrowed upwards.

\* Stem and veil white. In some instances there is a transient shade of violet at apex of stem.

*C. firmus*.—Cap about 3 in. across, tawny ochraceous; gills crowded, brown; stem about 3 in. long, clavate or rather bulbous, white.

Grassy places in mixed woods.

*C. subferrugineus*.—Cap about 3 in. across, often wavy, rusty, pale and shining when dry; gills rusty; stem about 3 in. long, more or less bulbous, pallid, base dull orange.

Smell and taste unpleasant.

On the ground amongst leaves.

*C. armeniacus*.—Cap 2–4 in. across, broadly umbonate, smooth, tawny cinnamon, then paler; gills crowded, shining, cinnamon; stem 2–3 in. long, fibrillose, conical, white.

In woods, especially pine.



*C. damascenus*.—Cap about 3 in. across, orbicular, usually squamulose when dry, cinnamon-bay ; gills pale cinnamon ; stem about 3 in. long, fibrillose, white, veil white, fugacious.

In meadows and pastures. Somewhat clustered.

*C. privignus*.—Cap about 2 in. across, obtusely umbonate, brown, hoary, pale when dry ; gills broad, cinnamon, edge serrate, whitish ; stem about 3 in. long, often twisted, pale, silvery.

Very fragile, scented, but scarcely acrid.

Damp places in pine woods.

*C. duracinus*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{4}$  in. across, pale tan ; gills cinnamon ; stem  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long, swollen at or below the middle, ending in a tapering rooting base, whitish.

On the ground in woods.

*C. illuminus*.—Cap  $1\frac{1}{2}$ –3 in. across, pale brick-red ; gills adnate, cinnamon ; stem 2–4 in. long, narrower upwards, pallid, becoming rusty.

In pine woods.

*C. tortuosus*.—Cap  $1\frac{1}{2}$ –2 in. across, shining rusty bay or brick-red ; gills crowded, tawny, blood-red when bruised ; stem 3–4 in. long, silvery.

Cap and gills becoming blood-red or purplish when bruised.

In damp woods.

*C. dilutus*.—Cap about 2 in. across, umbonate, bay-brown to pale brick-red, pale when dry ; gills deeply ventricose, cinnamon ; stem 2–3 in. long, whitish.

In woods. Inodorous.

\*\* *Stem and gills usually becoming violet.*

*C. saturninus*.—Cap 2–3 in. across, dark bay or brick-red, edge silky white ; gills purplish, then rusty ; stem 2–3 in. long, deep violet, then whitish.

In grassy places.

*C. imbutus*.—Cap 2–4 in. across, yellowish tan, then paler ; gills greyish violet, then cinnamon ; stem 2–3 in. long, whitish, apex tinged violet.

In woods.

*C. castaneus*.—Cap about  $1\frac{1}{2}$  in. across, often irregular, brownish chestnut, shining, umbo becoming blackish ; gills purple-violet, then rusty ; stem about 1 in. long, violet or pallid red.

Grassy places in woods, pastures, etc.

*C. bicolor*.—Cap 1–2 in. across, umbonate, dingy whitish with a tinge of lilac ; gills purplish violet, then cinnamon ; stem about 2 in. long, pallid violet, then whitish.

On the ground in mixed woods.

\*\*\* *Stem and imperfect veil yellow or rufous.*

*C. balaustinus*.—Cap  $1$ – $2\frac{1}{2}$  in. across, virgate with fibrils, reddish

rusty, tawny brick-red and shining when dry ; gills rusty ; stem about 3 in. long, rusty inside and outside.

In beech woods, etc.

*C. colus*.—Cap 1–2 in. across, rufous brown, then brick-red and shining ; gills dark cinnamon ; stem about 4 in. long, fibrillose, colour of cap, base surrounded by fiery orange or blood-red down.

In pine woods.

*C. isabellinus*.—Cap about 2 in. across, umbonate, smooth, yellowish ; gills yellow, then cinnamon ; stem about 4 in. long, striate, yellowish.

In dry pine woods.

*C. renidens*.—Cap 1–2 in. across, shining, tawny, ochraceous when dry ; gills crowded, tawny ; stem  $1\frac{1}{2}$ –2 in. long, smooth, yellow.

In shady woods. Usually slightly tufted.

*C. angulosus*.—Cap 2–3 in. across, wavy, reddish tawny with darker spots ; gills tawny ; stem  $1\frac{1}{2}$ –2 in. long, striate, twisted, tawny.

Among mosses in pine woods, etc.

\*\*\*\* *Stem dusky, veil pallid, dingy or white ; gills dark.*

*C. unimodus*.—Cap about 1 in. across, campanulate, then expanded, obtusely umbonate, usually depressed round the umbo, edge arched, then spreading, smooth, shining, rufous brown ; gills adnexed, distant, ventricose, brownish ; stem 2–3 in. long, fibrous, brown below, pale above, hollow, veil whitish, fugacious.

In grassy places.

*C. uraceus*.—Cap 1–2 in. across, umbonate, umber or brown, sometimes with an olive tinge, paler when dry ; gills cinnamon-brown ; stem 2–4 in. long, brown, sometimes with an olive tinge, at length blackish brown.

In pine woods.

*C. jubarinus*.—Cap 1–2 in. across, umbonate, tawny cinnamon, shining ; gills adnate, cinnamon ; stem about 2 in. long, fibrillose, pale tawny.

Closely resembling *C. cinnamomeus*, differing in the white, fibrillose, fugacious veil.

In pine woods, on pine needles, etc.

*C. pateriformis*.—Cap about 1 in. across, chestnut brown, at first silky white round the edge ; gills brick-red or cinnamon ; stem 2–3 in. long, fibrillose, brownish.

Among grass in woods, etc.

2. *Cap acutely umbonate, flesh very thin, edge straight at first.*

*C. dolabratus* (Pl. XXIII, fig. 3).—Cap 2–4 in. across, brick-red, tan when dry ; gills tawny cinnamon ; stem 4–6 in. long, smooth, white.

In pine woods among *Vaccinium*, *Sphagnum*. Smell strong.



*C. krombholzii*.—Cap 1–2 in. across, rather fleshy, conico-campanulate, then gibbous, even, smooth, pale yellowish tan, edge thin, with fragments of the veil hanging from it ; gills rusty, edge yellowish ; stem 3–5 in. long, slender, equal, smooth, whitish, hollow, veil white, membranaceous, soon disappearing from the stem, but persisting at the edge of the cap.

A remarkable species, having the rusty spores of a *Cortinarius*, but with a membranaceous, and not fibrillose veil, that remains in fragments at the edge of the cap. With the habit of a *Hypholoma*.

On the ground in woods. Somewhat tufted.

*C. leucopus*.—Cap up to 1 in. across, thin, conical, then expanded, obtusely umbonate, edge arched, when dry silkily shining, yellowish clay-colour with a suggestion of pink ; gills rather crowded, pale, then cinnamon ; stem equal, white, becoming hollow, about  $1\frac{1}{2}$  in. long.

Small. With the habit of *Cortinarius pluvius*, but not at all viscid.

On the ground in woods.

*C. rigens*.—Cap 1–3 in. across, smooth, tan-colour, then pale ; gills very broad, cinnamon ; stem 2–4 in. long, rooting, pallid, then white.

In woods.

*C. reedii*.—Cap about 1 in. across, strongly umbonate, edge splitting, brown, gills broad, cinnamon ; stem about 1 in. long, rather bulbous, white.

Among moss, beech mast, etc.

*C. scandens*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, rusty, then honey-colour ; gills tawny cinnamon ; stem 3–4 in. long, narrowed downwards, wavy, shining white, but yellowish under the silkiness.

Damp places in fir woods.

\*\* *Stem violet or reddish*.

*C. erythrinus*.—Cap 1– $1\frac{1}{2}$  in. across, umbonate, rufous bay, tawny when dry ; gills cinnamon ; stem  $1\frac{1}{2}$ –3 in. long, white tinged violet above.

Damp woods amongst leaves, etc.

*C. decipiens*.—Cap  $\frac{2}{3}$ –1 in. across, conical, then depressed round the umbo, bay-brown, brick-red when dry ; gills reddish rusty ; stem 2– $2\frac{1}{2}$  in. long, with a separable pallid cuticle, pale brick-red within.

In woods.

*C. germanus*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, obtusely umbonate, brownish, pale tan when dry ; gills adnate, pale cinnamon ; stem 2–3 in. long, twisted and wavy, lilac, then pale.

Stem becoming silvery, cap not striate. Smell strong.

In beech woods.

\*\*\* *Stem becoming yellowish, usually growing pale.*

*C. detonsus*.—Cap 1–2 in. across, subumbonate, striate to the middle when moist, bright yellow, tan when dry; gills bright yellow, then reddish cinnamon; stem 2–3 in. long, smooth, pale yellow, then pallid.

In damp pine woods among moss, etc.

*C. obtusus*.—Cap  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across, obtusely umbonate, edge striate, rusty bay, then pale ochre, sometimes becoming torn into fibrils; gills rusty, then cinnamon; stem 2–4 in. long, yellowish, then white.

In woods. Gregarious.

*C. acutus*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, umbo acute, yellowish honey-colour, pale when dry; gills ochraceous cinnamon; stem 3–4 in. long, wavy, whitish fibrillose, colour of the cap.

In mixed woods.

\*\*\*\* *Stem becoming dusky.*

*C. junghuhnii*.—Cap about 1 in. across, papillately umbonate, striate to the middle when moist, slightly velvety, shining cinnamon, tan when dry; gills saffron-brick-red; stem 2–3 in. long, pale brick-red, shining.

In woods among moss.

*C. depressus*.—Cap about 2 in. across, umbonate, rusty brown, tan when dry; gills yellowish saffron, then rusty; stem 1–2 in. long, reddish, whitish silky.

Damp woods. Smell weak, like stale fish or cucumber.

*C. milvinus*.—Cap  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across, slightly umbonate, striate, fawn-colour tinged olive, pale tan when dry, edge with white squamules; gills rusty olive; stem 2– $2\frac{1}{2}$  in. long, curved, pale brown with white, silky patches.

In woods. Strong-scented.

*C. fasciatus*.—Cap  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, acute umbo blackish, remainder brick-red, pale when dry; gills distant, cinnamon; stem 3–4 in. long, wavy, pale brown, then cinnamon.

Remarkable for the stem splitting longitudinally into fibres.

Damp places under pines.

#### CREPIDOTUS

Cap excentric, often resupinate or attached by the edge; stem excentric, lateral or absent; gills decurrent or radiating from a point; spores rusty.

Care must be taken not to confound the species with those of *Pleurotus* (white spores), and of *Claudopus* (pink spores).

*C. palmatus*.—Cap 2–4 in. across, irregular, rusty; stem excentric or lateral, whitish; gills fixed to a collar, rusty.

On trunks.



*C. mollis*.—Cap  $1\frac{1}{2}$ –3 in. across, rather gelatinous, obovate or reniform, limp, dingy tan or greyish ; stem practically absent ; gills radiating from the point of attachment of the cap, cinnamon.

On rotten trunks, stumps, etc. Often imbricated.

*C. applanatus*.—Cap 1–2 in. across, soft, fragile, reniform or wedge-shaped, with a very short, lateral, whitish, downy stem ; gills crowded, narrow, cinnamon.

On rotten wood.

*C. alveolus*.—Cap  $1-2\frac{1}{2}$  in. across, obovate, wavy, attached by a lateral downy mass, brownish ochre ; gills starting from a definite point, broad, crowded, brownish tan.

Allied to *C. mollis*, but more fleshy and darker coloured, pale when dry, sometimes tinged olive at the edge.

On trunks.

*C. calolepis*.—Cap  $\frac{1}{2}-\frac{2}{3}$  in. across, sessile and fixed by a lateral downy point, pale with minute, crowded, rufescent points ; gills radiating, rusty brown.

On rotten trunks and branches of aspen, etc.

*C. epibryus*.—Cap 2–3 lines across, sessile, silky, white ; gills radiating from the centre, becoming reddish yellow.

Differs from *Claudopus variabilis* in the more regular form, cup-shaped and entire, and without a rudimentary stem.

On mosses, leaves, etc.

*C. ralfsii*.—Cap  $\frac{1}{2}-\frac{3}{4}$  in. across, yellow, edge incurved, scurfy, fixed by cottony down ; stem obsolete ; gills rather broad, tan-colour, edge whitish.

On decaying wood. Somewhat gregarious.

*C. epigæus*.—Cap  $\frac{1}{2}$ –1 in. across, thin, fragile, reniform or fan-shaped, reddish bay, base downy ; gills narrow, reddish.

On the ground in damp places.

*C. haustellaris*.—Cap  $\frac{1}{4}-\frac{2}{3}$  in. across, rather fleshy, reniform or kidney-shaped, plane, even, minutely downy, tan-colour ; gills determinate, rounded behind, pallid, then brownish cinnamon ; stem distinct, lateral or very excentric, up to  $\frac{1}{4}$  in. long, narrowed upwards, downy, white.

Closely resembles *C. calolepis*, but regular in form, not tufted in growth, and especially distinguished by the subconical stem and almost free gills.

On fallen branches of poplar, etc.

*C. phillipsii*.—Cap about 3 lines across, rather fleshy, oblique, striate, smooth, pale umber ; gills narrow, ventricose, slightly adnate, pale dingy tan ; stem short, solid, incurved at the base.

Distinguished by the dingy umber cap, and the short, incurved stem.

On rotten branches.

*C. pezizoides*.—Cap about 2 lines across, sessile, thin, cup-shaped, then reflexed, mealy, subtomentose, whitish ; gills radiating from the centre, rather distant, olive-brown, then dull tawny.

Distinguished among minute species by the mealy cap. The fungus becomes resupinate, that is, with the gills turned upwards.

On rotten branches.

*C. chimnophilus*.—Cap 2–3 lines across, flesh rather thick, convex, edge incurved, downy, whitish ; gills narrowed behind, distant, narrow, pale tan ; stem very short or obsolete, excentric.

Known amongst the small white species by the downy cap and the few distant gills.

*C. rubi*.—Cap about  $\frac{1}{4}$  in. across, fleshy, convexo-plane, edge incurved, dingy pale yellowish tan, covered with a very delicate crystalline meal ; gills adnato-decurrent, rather broad, greyish, then umber, slightly ventricose ; stem about 3–5 lines long, incurved, solid, pallid, strigose at the base.

On dead bramble stems, etc.

*C. putrigenus*.—Imbricate. Cap somewhat kidney-shaped, whitish, downy ; gills broad, becoming rusty brown,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across.

On damp wood.

#### Sub-Family MELANOSPOREÆ

Although usually spoken of as the black-spored group, this is not literally correct, for the spores, when seen in the mass, thrown down on white paper, are not absolutely black ; nevertheless the spores so much more nearly approach to black than do the spores of any fungus belonging to the Ochrosporeæ, that no confusion can possibly exist. In some books the Melanosporeæ, as here understood, is broken up into two groups, named, respectively, Melanosporeæ and Porphyrosporeæ. In the first-named the spores, when seen in the mass, are blackish, without any tinge of purple or brown, whereas in the Porphyrosporeæ the blackish mass of spores has a tinge of purple or brown. These differences are perhaps more obvious when the spores are examined under the microscope by transmitted light. In the present book it has not been considered advisable to retain these two distinctions, which are of doubtful value. Much variety of structure is met with, perhaps the most remarkable feature being the deliquescence of the gills in the genus *Coprinus*, where, at maturity, the gills, and in some instances also the cap, become resolved into a dripping, ink-like fluid. This deliquescence of the gills is present in a less marked condition in certain other species, as in the common mushroom, and in certain species of *Hypholoma*.

As a rule the flesh of the cap is thin in many species, truly membranaceous. On the other hand, in a few species the flesh of the cap is thick, as in the common mushroom, but this is certainly the exception to the general rule. Again, the stem is, as a rule,



relatively long and slender, the common mushroom and a few others again being exceptions.

The bright colours predominating in the other sub-families are generally absent, whitish, dingy grey, or brown being the most general tints met with. Exceptions occur in the bright verdigris-green colour of *Stropharia æruginosa*, and in the genus *Hypholoma* there are a few species having the cap clear yellow or fiery orange.

Species furnished with a volva, or a ring, are present. The gills may be free, adnate, or adnexed, but no species belonging to the group has decurrent gills. It is true that in *Gomphidius* the gills are decurrent, but this genus has no affinity whatever with any genus included in the Melanosporeæ. It is simply placed here because it must go somewhere, and the spores are dark-coloured, but not black. The solution of the problem, as to the real affinity of this genus, and it must have an affinity, might be taken in hand by some student yearning for distinction.

The simplest types of structure, as lateral-stemmed, or sessile, resupinate species, are absent from the group. Some of our most valued edible species are included in the genera *Agaricus* and *Coprinus*.

#### KEY TO THE GENERA

##### A. Gills free from the stem

|                              |                   |
|------------------------------|-------------------|
| Volva present ; ring absent. | <i>Chitonia</i> . |
| Ring present ; volva absent. | <i>Agaricus</i> . |
| Volva and ring both absent.  | <i>Pilosace</i> . |

##### B. Gills attached to the stem (quite free from the stem in some species of *Coprinus*).

##### † Stem with a distinct membranaceous ring.

Gills adnate to the stem, dark brown or purplish. *Stropharia*.

Gills adnexed, grey and clouded with the black spores. *Anellaria*.

##### †† Ring very imperfect or absent ; gills decurrent.

Gills subgelatinous. *Gomphidius*.

##### ††† Gills not decurrent, nor adhering to each other when young, not deliquescent.

Gills sinuate, dark brown or blackish purple, veil often hanging in fragments from the edge of the cap. *Hypholoma*.

Cap not striate, edge extending slightly beyond the gills.

*Panæolus*.

Cap sulcate or striate.

*Psathyrella*.

Stem fragile ; edge of cap straight when young.

*Psathyra*.

Stem tough ; edge of cap incurved when young.

*Psilocybe*.

##### †††† Gills adhering together by their sides when young, deliquescing at maturity.

Ring and volva present in some species ; ring alone present in others ; absent in others ; gills adnate, adnexed, or free. *Coprinus*.

## NOTES ON THE GENERA

## CHITONIA

This is not an indigenous genus, the single species met with in this country being found in the Aroid house, Kew Gardens, having been introduced along with exotic plants. Distinguished among black-spored genera by the presence of a well-developed volva at the base of the stem, and the free gills.

## AGARICUS

This genus includes the common mushroom, *Agaricus campestris*. The cap is fleshy and the stem stout. The prominent features are free gills, and a ring round the stem. Bright colours are mostly absent, white or dingy brown predominate. In some species the cap is scaly. As in the common mushroom, the flesh of the cap and stem often change from white to reddish brown when cut. In some species the flesh changes to a blood-red colour when cut or bruised. Several species are included amongst the best of edible fungi. All grow on the ground, many in open pastures, but some are only met with in woods.

*Agaricus* agrees structurally with the genus *Lepiota* in the Leucosporeæ.

## PILOSACEÆ

The fungi belonging to this genus are fleshy, and superficially resemble members of the genus *Agaricus*, from which they are at once distinguished by the absence of a ring on the stem.

## STROPHARIA

Usually medium-sized fungi, with a fairly fleshy cap, differing from *Hypholoma* in having a permanent, well-formed ring on the stem. Differing from *Agaricus* in having the gills attached to the stem, that is, either adnate or adnexed. The cap is often viscid, and sometimes ornamented with scales, which often disappear at an early period of development. In some species the cap and stem are of a bluish green or verdigris colour. The species usually grow on the ground or on dung.

*Stropharia* agrees in structure with *Armillaria* in the Leucosporeæ, with *Pholiota* in the Ochrosporeæ.

## ANELLARIA

The only genus in the Melanosporeæ, having a ring present on the stem in all the species. There is no tendency to deliquesce, a point that separates *Panaeolus* from those species of *Coprinus* having the stem furnished with a ring. The cap is always smooth and even. The gills are dark grey, and variegated with the black



spores. The stem is elongated, whitish, and shining. Growing on dung or rich soil.

#### GOMPHIDIUS

A genus including only a very few British species, which are readily recognized by the peculiarly tough, elastic consistency of the entire plant, usually very viscid or glutinous. The gills are always distinctly decurrent. The spores are exceptionally large, narrowly fusiform or spindle-shaped, dingy olive, resembling the spores of *Boletus*. A genus without any close affinities, and which might, with equal reason, have been placed in any other group having coloured spores.

#### HYPHOLOMA

This genus contains several species that are abundant everywhere, forming dense tufts at the base of dead stumps, posts, etc. The prevailing colour is yellow with a rufous or inclining to brick-red centre. The secondary veil does not form a distinctly membranaceous ring round the stem, thus separating this genus from its closest ally, *Stropharia*, but mostly remains in the form of fragments attached to the edge of the cap. The gills in some species are inclined to be deliquescent, but such differ from *Coprinus* in the fleshy cap, solid stem, and brighter colours.

Agrees in structure with *Tricholoma* in the Leucosporeæ, with *Entoloma* in the Rhodosporeæ, and with *Hebeloma* in the Ochrosporeæ.

#### PANÆOLUS

Closely allied to *Anellaria*, differing mainly in the absence of a ring on the stem. The cap remains persistently conical or campanulate. The gills are dark grey and mottled with the black spores. The stem is always smooth. The species grow on dung or rich ground.

#### PSATHYRELLA

The distinctly striate cap is a strong suggestion of the genus *Psathyrella*, which differs from the striate forms of *Coprinus* in not being at all deliquescent. The present genus is also closely allied to *Psathyra*, which differs in the purple or brown colour of the spores.

Mostly small fungi, with rather elongated, slender, usually whitish stems.

#### PSATHYRA

Cap thin, generally campanulate at first, stem usually elongated, slender, and whitish. Known from *Psilocybe* by the edge of the cap being straight (not incurved) and pressed to the stem when young. Differs from *Psathyrella* in having brown or purplish gills and spores.

All the species are slender and hygrophanous, growing on the ground or on decayed trunks of trees. Often tufted.

Corresponds in structure to *Mycena* in the Leucosporeæ, to *Nolanea* in the Rhodosporeæ, and to *Galera* in the Ochrosporeæ.

## PSILOCYBE

All the species, with one exception—*Psilocybe sarcocephala*—are slender, growing on the ground, gregarious or often tufted, inodorous; stem slender, often rooting. Most nearly allied to *Psathyra*, under which genus the distinctions are noted. Analogous with *Collybia* in the Leucosporeæ, *Leptonia* in the Rhodosporeæ, and with *Naucoria* in the Ochrosporeæ.

## COPRINUS

This genus includes a large number of species, all of which bear a strong general resemblance, and when once the main features of the genus are grasped there should be little difficulty in recognizing a *Coprinus*. One marked characteristic is their ephemeral duration; many species do not last for a day in the mature condition; many of the smaller species do not persist for more than a few hours. Another feature of almost universal occurrence is the gradual deliquescence of the gills, which commence from the edge and melt away into a blackish liquid as the spores are shed. In all species the flesh of the cap is thin, and in many of the smaller kinds it is reduced to an exceedingly thin membrane, which either melts away along with the gills or dries up and resembles a piece of crumpled tissue-paper. In some of the higher species a volva or ring is present on the stem. Some are edible. None are known to be poisonous.

Most of the species grow on manure or on soil where dung has been scattered about.

*Bolbitius* in the Ochrosporeæ agrees with *Coprinus* in general structure, in ephemeral existence, and in the deliquescence of the gills.

## CHITONIA

Universal veil present, forming at maturity a distinct volva round the base of the central stem, which is devoid of a ring; gills free from the stem; spores brownish purple.

A species belonging to this genus was found growing on soil in the Aroid house, Royal Botanic Gardens, Kew, and had undoubtedly been introduced along with tropical plants. The genus is not indigenous in Europe.

*C. rubriceps*.—Cap  $\frac{2}{3}$ –1 in. across, rather fleshy, campanulate, then expanded, umbonate, often becoming depressed round the umbo, margin arched, slightly striate, smooth, reddish brown; gills free, narrow, rather crowded, purplish brown, dry; stem about 3 in. long, slender, equal, smooth, even, paler than the cap, hollow; volva large, free, whitish, torn irregularly at the margin.



## PLATE XXIV

1. STROPHARIA SEMIGLOBATA
2. PSILOCYBE SEMILANCEATA
3. COPRINUS COMATUS
4. HEBELOMA FASTIBILE
5. PISTILLARIA QUISQUILARIS
6. TYPHULA PHACORRHIZA
7. NOLANEA NIGRIPES
8. INOCYBE RIMOSA
9. SECTION THROUGH CAP OF FIG. 8
10. AGARICUS CAMPESTRIS
11. FISTULINA HEPATICA



PLATE XXIV.





## AGARICUS

Cap regular, gills free from the stem, finally dark reddish brown or umber ; stem central, with a distinct ring.

The free gills and a ring on the stem mark this genus. The species are all terrestrial.

*A. augustus*.—Cap 4–7 in. across, almost globose at first, then expanded, very obtuse, quite pale brown or yellowish, squamulose ; gills narrow, pale, then brown ; stem 4–5 in. long, stout, thinner upwards, whitish, ring large, persistent.

Distinguished from *A. campestris* by its larger size and by the flesh of the cap not becoming brown when broken. Our best edible fungus, but unfortunately rare.

In gardens, orchards, and woods.

*A. perrarus*.—Cap fleshy, campanulate, then expanded, yellow, with imbricated tawny scales, 3–5 in. across ; gills free, very remote from the stem, crowded ; stem whitish, with evanescent brown scales below the large, superior, reflexed ring.

Among grass, under trees.

*A. elvensis*.—Tufted. Cap 4–6 in. across, subglobose, then expanded, crowded with large brown scales, margin more or less warted ; gills brownish flesh-colour ; stem 4–6 in. long, thickest at the centre, stout, fibrillose, ring thick, large, warted underneath.

Differs from *A. augustus* in colour and warted edge of cap. Delicious eating.

On the ground under trees, especially oak.

*A. campestris* (Pl. XXIV, fig. 10) (common mushroom).—Cap 3–6 in. across, globose, then convexo-plane, dry, silky, whitish, flesh thick, becoming reddish brown when broken ; gills crowded, pink, then blackish brown, subdeliquescent ; stem 3–4 in. long, white, ring more or less persistent.

The well-known edible mushroom. The gills have a tendency to deliquesce, as in *Coprinus*.

In rich pastures, etc.

var. *silvicola*.—Cap smooth, shining ; stem long, hollow, somewhat bulbous, ring large.

In woods.

var. *pratensis*.—Cap covered with small rufous scales.

var. *hortensis*.—Cap brownish, fibrillose or squamulose.

This is the variety or, as some consider, a distinct species, commonly cultivated.

var. *vaporarius*.—Cap and stem covered with a brown hairy coat.

var. *costatus*.—Small. Cap grooved, wavy ; ring large.

var. *rufescens*.—Cap rufous ; flesh bright red when bruised.

var. *exannulatus*.—Cap scaly ; stem long, ring obsolete.

*A. arvensis* (horse mushroom).—Cap 5–10 in. or more across, whitish, nearly or quite smooth ; gills whitish, then reddish or



purplish brown ; stem 3–5 in. long, almost equal, whitish, smooth, ring drooping, double.

Smell strong. Differs from *A. campestris* in the double ring and in the gills having no rosy tinge when young. Edible.

In pastures. Often growing in rings.

var. *xanthoderma*.—Cap fleshy, becoming pale primrose-yellow when bruised.

var. *villaticus*.—Cap covered with brownish scales. Large.

var. *purpurascens*.—Small. Cap tinged purple, deepest at disc.

*A. silvaticus*.—Cap 3–4 in. across, campanulate, then expanded and gibbous, fibrillose, disc brownish, rest pale, flesh tinging brown ; gills reddish, then brown ; stem 4–6 in. long, even, whitish, hollow, ring simple.

Known from all forms of *A. campestris* by the long hollow stem, which is not bulbous at the base as in var. *silvicola*.

In woods.

*A. pratensis*.—Cap 2–3½ in. across, ovoid, then expanded, smooth or with concentric squamules, whitish, then greyish ; gills greyish, then brown ; stem about 2 in. long, base thickened, smooth, whitish, ring usually disappearing.

In pastures and woods.

*A. hæmorrhoidarius*.—Cap 3–5 in. across, ovate, then expanded, brownish, disc often tinged red or purple, coarsely squamulose, flesh thick, white, becoming deep red when wounded ; gills rosy, then purplish umber ; stem 4–5 in. high, more or less swollen at the base, hollow, white, silky, becoming blood-red when bruised, ring large, persistent.

Distinguished by almost instantly becoming deep red when wounded.

In woods, etc.

*A. peronatus*.—Cap 4–5 in. across, hemispherical, then expanded, dull ochre, minutely scaly ; flesh unchangeable ; gills pink, then purple-brown ; stem 5–6 in. long, bulbous, hollow, scaly up to the ring, smooth above.

Readily distinguished by the scaly stem.

In pine woods.

*A. rusiophyllus*.—Cap soon plane, slightly umbonate, pale flesh-colour, about 1 in. across ; gills free, crowded, thin, dry, rosy, then brownish ; stem about 1½ in. long, becoming thinner upwards, white, ring persistent, drooping.

On the ground.

*A. sagatus*.—Cap 1½–2 in. across, convex, then almost plane, even, smooth, shining reddish brown ; gills pink, then purple-umber ; stem about 2 in. long, hollow, pale, ring persistent.

Distinguished by the reddish brown cap.

Among grass under trees.

*A. comptulus*.—Cap 1–2 in. across, convex, then plane, silky or smooth, white ; gills flesh-colour, then reddish brown ; stem about 2 in. high, whitish, ring fugacious.

Among grass.

*A. subgibbosus*.—Cap up to 1 in. across, almost flat, subumbonate, smooth, yellowish, edge fibrillose ; gills white, then greyish brown ; stem about 1 in. long, ring fugacious.

In woods, etc.

#### PILOSACE

Cap regular, fleshy ; gills free from the stem ; general and partial veil both entirely absent ; stem central, stout ; spores purple-brown.

Almost exactly resembles *A. campestris* in general appearance, differing in the absence of a ring on the stem.

*A. algeriensis*.—Cap hemispherical with the edge incurved, then becoming depressed round the gibbous disc, and with the edge up-turned and often splitting, snow-white, minutely silky, 3–4 in. across ; flesh thick except at the edge, white ; gills distant from the stem, narrow, slightly broadest in front, dark brownish purple ; stem 2–3 in. long, equal, firm, even, silky, white, differentiated from the flesh of the cap, solid, 2–3 in. long.

This species has up to the present only been found in one locality, near Scarborough, in this country. As it is difficult to distinguish in the field from *A. campestris*, unless attention is paid to the absence of a ring on the stem, it has possibly been passed over as that species.

On the ground among grass.

#### STROPHARIA

Cap regular, often rather fleshy and with a viscid pellicle ; gills becoming dark brown or purplish ; stem central, with a distinct ring.

Readily distinguished amongst the Porphyrosporeæ by the gills being attached to the stem and the ring on the stem.

1. *Cap viscid, at least when damp.*

\* *Not growing on dung.*

*S. percevali*.—Cap 1½–2 in. across, viscid, ochraceous, umbonate, with a few white squamules which often disappear ; flesh dusky ; gills greyish, then umber ; stem 2–3 in. high, hollow, flesh dark, pale above ring, transversely squamulose below.

On rotten wood, sawdust, etc.

*S. versicolor*.—Cap 1–4 in. across, scaly ; gills running down the stem, pallid, then reddish brown ; stem whitish, bulbous, ring persistent.

An imperfectly known fungus.



*S. æruginosa*.—Cap 2–3 in. across, convex, then almost plane, sometimes subumbonate, viscid, verdigris-green with white scales that disappear ; gills purplish ; stem 2–3 in. high, greenish, ring present.

The finest specimens grow in woods, etc. ; in open pastures the fungus is usually smaller and more dull ochraceous than green. The green colour fades into ochraceous from the apex to the edge of the cap.

*S. squamulosa*.—Cap 2–3 in. across, soon plane, deep verdigris-green, silkily scaly, centre tan-colour ; gills brown with purple tinge ; stem paler than cap.

Distinguished from *S. æruginosa* by deep green, silky-looking, scaly cap.

Among stones and rubbish.

*S. albo-cyanea*.—Cap up to  $\frac{3}{4}$  in. across, becoming expanded, umbonate, viscid, bluish green, then pale ; gills at length purplish ; stem 1–2 in. long, wavy, dry, pale, tinged green, ring imperfect.

On the ground.

*S. worthingtoni*.—Cap about 1 in. across, smooth, viscid, yellowish ; gills cinnamon-brown ; stem 2–3 in. long, wavy, dark blue, ring imperfect.

Differs from *S. albo-cyanea* in yellow cap and dark blue stem.

On the ground in woods and pastures.

*S. inuncta*.—Cap up to 1 in. across, rather umbonate, at first covered with a thick, glutinous, purplish pellicle that disappears, leaving the cap pale ; gills pale brown ; stem 2–3½ in. high, wavy, soft, white, ring soon disappearing.

Among grass.

*S. coronilla*.—Cap up to 1½ in. across, slightly viscid, tawny ochraceous, then pale ; gills purple-violet, then blackish ; stem about 1 in. long, white, ring striated.

With the habit of *Psallista comptulus*, but known by the gills being attached to the stem.

*S. ventricosa*.—Cap about 1 in. across, tawny ochre, paler when dry, slightly viscid ; gills purplish brown ; stem 2½–3 in. long, spindle-shaped below the middle and tapering into a long rooting base, pale yellow, ring large, white.

Tufted. Known by the fusiform or spindle-shaped stem.

On the ground.

*S. obturata*.—Cap ½–1 in. across, convex, then flat, yellow, becoming cracked into squamules ; gills pale, then purplish umber ; stem 1–1½ in. long, white, narrowed downwards as a rule, ring thickish.

Differs from *S. inuncta* and *S. albo-cyanea* by the shorter stem and stouter build.

On the ground in pastures.

*S. melasperma*.—Cap 1–2 in. across, convex, then plane or flat, slightly viscid, then dry and pale straw-colour ; gills deeply sinuate, becoming greyish black ; stem 1–2 in. long, apex striate, white, ring white, near top of stem.

Differs from *S. coronilla* in striate apex of stem.

On the ground in pastures.

*S. squamosa*.—Cap 1½–3 in. across, becoming almost flat, viscid, with concentrically arranged superficial scales, yellowish tan ; gills blackish, edge whitish ; stem 3–4 in. long, rusty and scaly below the distant ring, whitish and smooth above.

On the ground in woods.

var. *thraustus*.—Scales soon disappearing from the cap.

var. *aurantiaca*.—Cap orange or brick-red.

\*\* *Growing on dung. Ring often incomplete.*

*S. luteo-nitens*.—Cap up to 1 in. across, conico-campanulate, viscid, yellow, edge squamulose ; gills greyish black ; stem 1–1½ in. long, whitish, ring imperfect.

On dung.

*S. merdaria*.—Cap up to 1 in. across, soon almost flat, dingy yellowish brown or pale bay ; gills yellowish, then umber ; stem about 1 in. long, flocculose, pale, ring torn, fugacious.

On dung. Gregarious or somewhat tufted.

*S. stercoraria*.—Cap about 1 in. across, hemispherical, then expanded and discoid, yellow ; gills blackish olive, sometimes brownish purple ; stem 4–5 in. long, whitish with a yellow tinge, flocculose below the imperfect ring.

Close to *S. semiglobata*, differing in having a distinct cord-like pith in the stem, and by the flocculose stem when young, and the flat cap at maturity.

On dung.

*S. semiglobata* (Pl. XXIV, fig. 1).—Cap up to ¾ in. across, persistently subglobose, viscid, pale yellow ; gills greyish, clouded with black ; stem 3–5 in. high, smooth, viscid, yellowish, ring imperfect.

On dung.

2. *Cap without a viscid pellicle, adpressed, fibrillose.*

*S. caput-medusæ*.—Cap 1–2 in. across, expanded, often with depressed spots, squamulose, umber-brown at the centre, rest dingy ochre ; gills pale umber ; stem 2–4 in. long, with concentric rings of spreading squamules below the ring, smooth above, whitish.

In pine woods near the roots of trunks. Tufted.

*S. scobinacea*.—Cap 1–2 in. across, expanded, gibbous, striate, covered with adpressed, blackish squamules which may disappear, brownish, edge greyish violet ; gills reddish white, then purplish, edge crenulate ; stem 3–4 in. long, white, fibrillose, ring fugacious.

On trunks. Tufted.



*S. jerdoni*.—Cap up to 2 in. across, campanulate, with a broad, fleshy umbo, ochraceous with snow-white evanescent scales ; gills adnate with a line down the stem, pallid, then brown ; stem about 3 in. long, snow-white and mealy above, brownish with squamules below, ring drooping.

On fir stumps, etc.

*S. spintriger*.—Cap 2-4 in. across, expanded, obtuse, smooth, pale brown pinkish tan, then whitish ; gills brownish ; stem 2-3 in. long, white, floccose, apex smooth, ring fugacious.

On trunks. Tufted. Fragile.

*S. hypsipoda*.—Cap 1-2 in. across, convex, then flat, brownish yellow, edge pale ; gills dark brown ; stem 3-5 in. high, smooth, whitish, ring central on the stem, persistent.

Among grass, moss, etc. Solitary. Fragile.

#### ANELLARIA

Cap smooth, even, flesh thin ; gills dark grey mottled with the black spores ; stem central, smooth, shining, ring present at first, either persistent or represented by a zone round the stem.

Differs from *Coprinus* in the gills not being deliquescent.

*A. separata*.—Cap 1-1½ in. across, ovate, then campanulate, not expanding, viscid, dingy ochraceous, then pale and shining ; gills greyish black, edge paler ; stem 3-5 in. long, whitish, shining, ring persistent.

Cap generally wrinkled and pale when old.

On dung.

*A. scitula*.—Cap about ½ in. across, obtuse, campanulate, viscid, dirty pale ochre ; gills grey, speckled with black ; stem 1-1½ in. long, white, slender, base sheathed, sheath ending in a free border or ring.

On soil in a flower-pot. Rare.

*A. fimiputris*.—Cap 1-2 in. across, conico-expanded, gibbous, viscid, smoky grey, dingy ochre when dry ; gills greyish black ; stem 3-5 in. long, often rather wavy, smooth, pallid, ring imperfect, but its position marked by a zone on the stem.

On dung.

#### GOMPHIDIUS

Cap regular, fleshy, gradually expanding into stout stem ; gills decurrent, rather soft and mucilaginous, edge sharp ; veil viscid, forming an imperfect ring round the stem.

A very distinct genus characterized by the tough, elastic substance of the entire fungus. Cap very viscid when moist ; gills decurrent, soft and pliant, as is the whole fungus.

*G. glutinosus*.—Cap 2-5 in. across, glutinous, edge for a long time incurved, purplish brown or tawny, flesh thick, white ; gills whitish,

then grey, finally greenish olive ; stem 2-4 in. long, whitish, flesh whitish, yellow at base, veil viscid.

The whole fungus is elastic ; cap glutinous, distinguished by the bright yellow flesh at the base of the stem.

In fir woods.

*G. viscidus*.—Cap 2-6 in. across, obtusely umbonate, reddish brown ; gills elastic, branched, becoming purplish umber with an olive tinge ; stem 3-5 in. long, stout, pale yellow-brown, flesh yellowish brown, deepest near the base, ring imperfect.

Known from *G. glutinosus* by yellow-brown flesh of the stem.

Under fir trees, etc.

*G. maculatus*.—Cap about 3 in. across, convex, viscid, whitish, spotted or stained with black ; stem about 2 in. long, yellow, flesh reddish ; gills decurrent, thick, branched, umber.

In woods.

var. *cookei*.—Smaller than type. Stem not yellow, but whitish, and turning black at the base.

*G. roseus*.—Cap 1-2 in. across, glutinous, varying from pink to bright rose-colour ; gills whitish grey, then olive ; stem  $1\frac{1}{2}$ -2 in. long, whitish, tinged red below, ring imperfect.

In woods.

*G. gracilis*.—Cap about 1 in. across, conical, then hemispherical, sometimes subumbonate, dingy tan-colour or vinous brown, covered with a smoke-coloured gluten that leaves blackish spots when dry ; gills forked, whitish, then brownish, finally blackish ; stem  $1\frac{1}{2}$ -2 in. long, wavy, pallid, base yellow, ring obsolete.

In fir woods.

#### HYPHOLOMA

Cap regular, edge at first incurved ; gills brown with a purple tinge ; stem central, veil adhering in fragments to the edge of the cap, not forming a distinct ring on the stem.

Differs from *Stropharia* in the absence of a distinct ring on the stem, when a trace of a ring is present it consists of loose cobweb-like threads. Mostly tufted and growing on wood.

\* *Fasciculate* ; cap smooth, bright-coloured, not hygrophaneous.

*H. silaceum*.—Cap about 3 in. across, convex, viscid, orange-brown, whitish near the edge ; gills crowded, grey, then olive ; stem about 3 in. long, fibrillose, swollen at the base.

On the ground.

*H. sublateritium*.—Cap 2-4 in. across, becoming almost plane, brick-red tinged orange, edge paler ; gills whitish, then sooty olive ; stem 3-5 in. long, fibrillose, rusty or yellowish, stuffed.

Larger than *H. fasciculare*, differing in the plane cap and stuffed stem. Taste bitter.

On and around stumps. Tufted.



var. *schaefferi*.—Cap yellow, conical, then depressed, wrinkled ; gills decurrent.

var. *squamosus*.—Cap bright brick-red, shading into yellow at the edge, spotted with superficial scales.

*H. capnoides*.—Cap 1–1½ in. across, plane and subumbonate or depressed, smooth, yellowish or tinged tawny ; gills sooty grey, then purplish ; stem 2–4 in. long, silky, pallid.

Distinguished by the very smooth yellowish cap and the absence of yellow or olive-green in the gills. Stem brownish under the superficial white silkiness.

In pine woods, on trunks, and on the ground.

*H. epixanthus*.—Cap 2–3 in. across, becoming almost flat, pale yellow, disc darker ; gills pale yellow, becoming clouded with grey ; stem 3–5 in. long, whitish, base brownish.

Known by the clear yellow gills ; smell strong.

On old fir stumps, etc. Tufted.

*H. fasciculare* (Pl. XXVI, fig. 11).—Tufted. Very bitter. Cap 1–2 in. across, expanded and subumbonate, tawny, edge yellow ; gills yellow, then greenish, somewhat deliquescent ; stem 3–4 in. long, curved or wavy, fibrillose, yellow.

One of the commonest of toadstools, occurring in dense clusters at the base of old trees, decaying stumps, posts, etc.

*H. elæodes*.—Cap up to 1½ in. across, soon almost plane and subumbonate, smooth, brick-red ; gills green, then pure olive ; stem 2–4 in. long, wavy, fibrillose, more or less rusty.

Differs from *H. fasciculare* in brick-red cap, rusty stem, and olive gills. Smell sour.

On trunks and on the ground. Tufted.

*H. instratum*.—Cap up to 1½ in. across, convex, broadly umbonate, dark brown, wrinkled ; gills brown, then purple-brown, edge paler ; stem 2–3 in. long, white, fibrillose or squamulose below.

Known by the dark brown, radiately wrinkled cap.

On stumps.

*H. dispersum*.—Cap up to 1 in. across, campanulate, then expanded, tawny, honey-colour at the edge ; gills straw-colour clouded with dull green ; stem 2–4 in. long, silky-fibrillose, tough, pale.

On trunks and on the ground. Scattered.

\*\* *Cap viscid, smooth.*

*H. incomptum*.—Cap 3–4 in. across, campanulate, then expanded and broadly gibbous, viscid, deep bay-brown, orange-tawny when dry ; gills pallid, then deep olive, finally clouded with purple ; stem about 3 in. long, pale above, dark rusty below, with spreading, rusty squamules and yellow down.

Easily known by the viscid dark bay cap and olive gills clouded with purple.

On stumps.

*H. ædipus*.—Cap up to 1 in. across, edge torn, disc umber, rest paler; gills whitish, then umber; stem about 2 in. long, whitish, becoming darker, enlarging downwards to a bulbous base, with a median ring.

Marked by the distinctly bulbous base of the stem.

On sticks or dead leaves, etc.

\*\*\* *Cap streaked or silky, with adpressed fibrils.*

*H. melantinum*.—Cap thin, convexo-campanulate, then expanded and becoming almost plane, dusky umber sprinkled with minute adpressed darker scales, becoming paler when dry,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across; gills adnexed, ventricose, somewhat crowded, broadish, umber, then blackish, with a violet tinge, dry; stem fistulose, fibrillose, pallid, 3–4 in. long (spores almond-shaped, minutely rough, opaque,  $9-11 \times 7-8 \mu$ ).

The general build and aspect of this species suggests *H. velutinum*, from which it differs in the umber-coloured cap, which is not at all fibrillose.

First collected in this country by the members of the Mycological Section of the Yorks Nat. Union, at the Sandsend Foray, September, 1910.

On the ground among moss.

*H. storea*.—Cap about 3 in. across, almost plane, umbonate, pale brownish or pale dingy ochre; gills brownish, edge white, serrulate; stem 4–5 in. long, fibrillose, pallid.

Surface of cap broken up into adpressed longitudinal fibrils.

On decayed beech trees, etc.

*H. hypoxanthum*.—Tufted. Cap about 2 in. across, viscid, dingy white, umbo darker squamulose with black fibrils which disappear; gills purple-brown, edge white; stem 2–4 in. long, curved, whitish, floccosely squamulose below, base with a yellow tinge; orange-yellow mycelium.

Known by yellow base of stem and orange-yellow mycelium.

On rotten beech wood, etc.

*H. lacrymabundum*.—Cap 2–3 in. across, convex, white, then brownish with darker adpressed squamules; gills crowded, brownish purple; stem about 2 in. long, whitish, then brownish, fibrillosely squamulose.

Cap and stem white, then brownish. Tufted.

On the ground and on trunks.

*H. pseudostorea*.—Cap convex, then expanded, at first purplish brown, disc darkest, breaking up into large fibrillose purplish brown scales on a pale ground, edge with fragments of veil when young;



gills white, then rosy, finally purple-brown, dry ; stem white above, pale yellowish below.

Smell strong, disagreeable.

On the ground in woods, under larches, etc.

*H. velutinum*.—Cap 2–4 in. across, campanulate, then expanded, obtusely umbonate, downy with adpressed fibrils, then almost smooth, dingy ochre ; gills brown spotted with black ; stem 3–4 in. long, silky-fibrous, coloured like the cap.

Not tufted or only slightly so. Gills with drops of water.

On the ground. Sometimes quite large.

var *leiocephalum*.—Smaller than the type form, densely tufted, cap wrinkled.

*H. pyrotrichum*.—Cap 2–4 in. across, conical, then hemispherical, covered with orange-tawny squamules ; gills pallid, then brownish ; stem 3–4 in. long, fibrillose or with spreading squamules, becoming tawny.

Tufted. Very showy, cap often bright tawny orange, veil fringing the incurved edge ; stem fibrous, often with spreading squamules.

var. *egregius*.—Cap with orange-red squamules, stem with spreading whitish scales up to the ring.

\*\*\*\* *Cap covered with superficial floccose scales which eventually disappear.*

*H. cascum*.—Cap up to 2½ in. across, oval, then expanded, almost smooth, wrinkled, dingy greyish ochre, then pale ; gills greyish, then blackish ; stem 3–4 in. long, fibrillose, white.

Among grass. Gregarious, but not tufted.

*H. punctulatum*.—Tufted. Cap about 1 in. across, pallid with a yellowish or brownish tinge, minutely squamulose ; gills pallid, then pale umber ; stem 1–2 in. long, rather swollen at the base, fibrillosely squamulose up to the ring.

On rotten twigs and chips. Densely tufted.

\*\*\*\*\* *Cap smooth, hygrophanous, fragments of the veil often fringing the edge.*

*H. lanaripes*.—Cap up to 2½ in. across, campanulate, then expanded, edge upturned and centre conical, pallid or dingy buff, minutely squamulose, veil in fragments at the edge ; gills whitish, then purple-brown ; stem 2–3 in. long, white, fibrillose.

On soil in conservatories.

*H. candolleanum*.—Cap up to 3 in. across, convex, then expanded, obtuse, smooth, bay when moist, almost white with ochraceous disc when dry, veil hanging in shreds from the edge ; gills pale violet, then brown ; stem 2–3 in. long, fibrillose, white.

Colour of cap changes from deep bay when moist to almost white when dry.

On stumps and on the ground. Tufted.

*H. appendiculatum* (Pl. XXVI, fig. 1).—Cap 2–3 in. across, ovate, then expanded, smooth, bay-brown when wet, whitish with an ochraceous tinge, wrinkled, and somewhat sparkling when dry; veil in fragments at edge of cap, but soon disappearing; gills whitish, then brownish flesh-colour; stem 2–3 in. long, white, smooth.

Densely tufted. Fragile. Differs from *H. candolleanum* in the absence of a violet tinge in the young gills.

*H. catarium*.—Cap up to  $\frac{3}{4}$  in. across, expanded, smooth, ochraceous, paler when dry; gills whitish, then brown; stem about  $1\frac{1}{2}$  in. long, white, rather shining, apex striate, base thickened and downy.

Among grass. Subcæspitose.

*H. leucotephrum*.—Tufted. Cap 2–3 in. across, subcampanulate, wrinkled, then expanded and whitish; veil here and there in fragments at the edge; gills greyish white, then blackish; stem 3–4 in. high, silky-fibrous, apex grooved, ring large.

Differs from *H. candolleanum* and *H. appendiculatum* in the cap not being brown when young and moist, and in the gills not being brown.

*H. egenulum*.—Cap about  $1\frac{1}{2}$  in. across, hemispherical, then expanded, umbonate, watery white, snow-white when dry, polished, veil in fragments at edge of cap; gills purplish umber, edge white; stem about 2 in. long, whitish.

Among grass.

*H. pilulæforme*.—Cap up to  $1\frac{1}{2}$  in. across, globose, then expanded, smooth, brown when moist, dingy ochre when dry; gills white, becoming brownish; stem about 1 in. long, smooth, white.

Resembles a small form of *H. appendiculatum*, differing in the gills having no tinge of flesh-colour.

A ring is present in the young state.

*H. hydrophilum*.—Cap 1–2 in. across, convex, then almost plane, wrinkled, disc even, bay when moist, tawny ochre when dry, edge slightly incurved and split, veil hanging in shreds at first, but soon disappearing; gills pallid, then brownish, exuding drops of water; stem about 2 in. long, pallid, usually curved.

Very much tufted, fragile, resembles in general appearance *Psilocybe spadicea*, from which it differs in the absence of a rosy tint in the gills. Very similar to *H. appendiculatum*, but widely different in the gills exuding drops of water, and in this feature agreeing with *H. velutinum*, although differing in other important features.

At the base of trunks, stumps, decaying posts, etc.

#### PANÆOLUS

Cap always even; gills slate-grey mottled with black; stem central, without a trace of a ring.



Known amongst the black-spored species by the even (not striate) cap. In *Anellaria* there is a ring on the stem ; in *Psathyrella* the cap is striate ; in *Coprinus* the gills deliquesce.

\* *Cap viscid, shining when dry.*

*P. leucophanes*.—Cap about  $\frac{3}{4}$  in. across, obtuse, campanulate, viscid, white, shining and silky when dry, with ochre stains, fragments of the veil attached to edge of cap, giving it a ragged appearance ; gills blackish, edge white ; stem about 2 in. high, fibrillose, white.

In grass fields.

*P. egregius*.—Cap up to  $2\frac{1}{2}$  in. high, ovate-campanulate, viscid and bright orange-brown, slightly wrinkled when dry ; gills brownish black, edge paler ; stem up to 5 in. long, pale brown.

Distinguished by its large size and brown stem.

On the ground.

*P. phalenarum*.—Cap 1–2 in. across, campanulato-convex, viscid, greyish, then dull ochraceous ; fragments of veil adhering to the edge ; greyish black ; stem 3–5 in. long, pale reddish pink.

Differs from *P. papilionaceus* in the viscid cap and ochraceous colour.

On dung.

\*\* *Cap not viscid, slightly flocculose when dry.*

*P. retirugis* (Pl. XXVI, fig. 4).—Cap about 1 in. across, globose, then hemispherical, subumbonate, pinkish tan-colour, with anastomosing raised ribs, fragments of veil attached to edge ; gills greyish black ; stem 2–4 in. long, purplish flesh-colour, mealy.

Differs from *P. phalenarum* in the wrinkled cap, and from *Psathyrea corrugis* in the gills not being violet-tinted.

On dung.

*P. sphinctrinus*.—Cap up to 1 in. across, smoky black when moist, livid when dry, edge with fragments of the white veil ; gills greyish black ; stem 2–3 in. long, smoky grey, fragile.

Differs from *P. papilionaceus* in the grey stem.

On dung, etc.

*P. papilionaceus*.—Cap up to 1 in. across, hemispherical, pale grey with a tinge of rufous at the disc, when dry cracking into minute squamules ; gills broadly adnate, plane, becoming blackish ; stem 3–4 in. long, whitish, apex powdered with white meal.

Differs from *P. campanulatus* by the paler, hemispherical cap, paler stem, and broader, broadly adnate gills.

On dung, manured ground, etc.

\*\*\* *Cap not viscid, smooth, shining, not zoned.*

*P. campanulatus*.—Cap about  $1\frac{1}{2}$  in. high, campanulate, often more or less umbonate, smooth, rather shiny, brown, becoming rufescent ; gills adfixed, grey variegated with black, edge often

whitish ; stem 3–5 in. long, rufescent, apex striate, at first powdered with white meal.

On manured ground.

*P. caliginosus*.—Cap about  $\frac{2}{3}$  in. high, brown ; gills smoky black ; stem 2–3 in. long, coloured like the cap.

Distinguished by the brown cap and stem.

Pastures among grass.

\*\*\*\* *Cap not viscid, with a darker marginal zone.*

*P. sub-balteatus*.—Tufted. Cap 1–2 in. across, convex, hygrophanous, deep fawn-colour with a darker zone at the edge ; gills brownish, edge pale ; stem 2–2 $\frac{1}{2}$  in. high, reddish brown, longitudinally fibrillose.

The dark zone appears to depend on the amount of moisture present in the flesh of the cap.

On the ground.

*P. acuminatus*.—Cap up to 1 in. across, conical, apex subacute, shining, dull ochre with a flesh tinge, a darker zone at the irregular edge ; gills becoming black ; stem 1–1 $\frac{1}{2}$  in. long, whitish above, base brownish, pruinose.

On dung and among grass.

*P. fimicola*.—Cap up to  $\frac{3}{4}$  in. across, dingy grey when moist, yellowish when dry, and with a darker marginal zone ; gills grey, variegated with black ; stem 2–4 in. long, whitish, powdered with white meal above.

On dung and rich ground.

*P. cinctulus*.—Cap 1–2 $\frac{1}{2}$  in. across, campanulate, then expanded, reddish cinnamon-colour with a deep darker marginal band, flesh  $\frac{1}{4}$  in. thick at the disc ; gills dusky black ; stem 3–5 in. long, brown.

Differs from *P. egregius* in the cap not being viscid.

On dunghills.

#### PSATHYRELLA

Cap thin, striated, thin, edge straight and pressed to the stem when young ; gills not deliquescent ; stem central.

Allied to *Psathyra*, but in the latter the spores are brown or purplish.

\* *Stem straight, apex not mealy.*

*P. subatrata*.—Cap 1–1 $\frac{1}{2}$  in. across, campanulate, then expanded, smooth, slightly striate at the margin, often wrinkled, rufous umber, paler when dry ; gills smoky, then blackish ; stem 4–5 in. long, shining, white, then pallid.

Tufted, cap often brownish orange, sometimes viscid.

Among grass.

*P. gracilis*.—Cap up to 1 in. across, conical, then expanded, slightly striate, brownish when moist, dingy yellow or tinged rose



when dry, and without any striæ ; gills broadly adnate, greyish black, edge rosy ; stem about 3 in. long, pallid.

Cap sometimes wrinkled. Known by the pink-edged gills.

On banks under hedges, etc.

*P. hiascens* (Pl. XXVI, fig. 9).—Cap about 1 in. across, campanulate, grooved and splitting, disc brownish, remainder greyish ; gills pale, then blackish ; stem  $1\frac{1}{2}$ –2 in. long, smooth, white.

Under hedges, damp woods, etc.

*P. arata*.—Cap up to 1 in. across, campanulato-conic, rather acute, deeply grooved, brown, paler when dry ; gills free, black with a purple tinge ; stem 4–5 in. long, smooth, white.

Distinguished from *P. subatrata* and others by the brown cap with a coarsely grooved margin, and the long, tapering white stem.

Under hedges, etc.

*P. trepida*.—Cap about 1 in. across, bell-shaped, edge often wavy, smooth, closely striate, smoky, apex brown ; gills sooty black ; stem about 3 in. long, whitish, smooth, pellucid.

In mud and damp places.

*P. hydrophora*.—Cap about 1 in. across, bell-shaped, then expanded, striate edge becoming upturned, disc rufous, rest paler ; gills livid, then black ; stem straight from a curved base, smooth, white.

On the ground in gardens, etc.

\*\* *Stem slightly wavy (not perfectly straight), apex mealy.*

*P. caudata*.—Cap  $1\frac{1}{2}$ –2 in. across, conico-campanulate, edge striate, pale ochraceous ; gills greyish black ; stem 3–5 in. long, often wavy, whitish, with a rooting base.

Very fragile. Splitting and almost deliquescent in rainy weather.

On the ground in gardens, etc.

*P. pronus*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, hemispherical, pale smoky ochre, silky-atomate when dry ; gills greyish black ; stem about  $1\frac{1}{2}$  in. long, wavy, whitish, pellucid.

var. *smithii*.—Cap 2 lines across, stem  $1\frac{1}{2}$  in. high, filiform.

*P. empyreumatica*.—Cap  $1\frac{1}{2}$  in. across, atomate, rufous, becoming pale, edge crenate ; gills purple-brown, edge pale ; stem 2– $2\frac{1}{2}$  in. long, minutely scurfy, pale. Smell strong.

On a wooden pavement.

*P. atomata*.—Cap about 1 in. across, bell-shaped, obtuse, indistinctly striate, pale ochraceous, when dry wrinkled and covered with glistening particles ; gills greyish, then black ; stem about 2 in. long, wavy, white, apex mealy.

Resembling *P. gracilis*, often becoming tinted rose-colour or whitish, but edge of gills not rosy.

On the ground under hedges, etc.

*P. crenata*.—Cap  $\frac{1}{2}$ –1 in. across, hemispherical, obtuse, edge crenate, grooved half-way up, whitish with a tinge of yellow; gills adnate, becoming blackish; stem  $1\frac{1}{2}$ –2 in. long, striate and mealy above, whitish.

Known by coarsley grooved cap with a crenate edge.

On the ground.

*P. disseminata*.—Cap about  $\frac{1}{4}$  in. across, thin, ovate-campanulate, coarsely striate, scurfy, then naked, edge entire, tinged yellow, then grey; gills narrow, becoming blackish; stem 1– $1\frac{1}{2}$  in. long, rather curved, mealy, then smooth.

Densely crowded, often forming crowded patches a foot or more across.

About trunks of trees and on the ground.

#### PSATHYRA

Cap thin, conical or campanulate, then expanded, edge at first straight and adpressed to the stem; gills purplish or brownish, as are also the spores; stem central, polished, hollow.

Nearest to *Psathyrella*, differing in the brown or purplish gills and brown spores.

\* *Cap conico-campanulate, gills ascending, stem straight, veil absent.*

*P. elata* (Pl. XXVI, fig. 7).—Cap up to  $1\frac{1}{2}$  in. across, thin, obtusely campanulate, dark brown when moist, pale ochre when dry, and then minutely atomate; gills crowded; stem 4–7 in. long, straight, white, shining.

Among grass on hedge banks, etc.

*P. conopilea*.—Cap about 1 in. across, conico-campanulate, bay-brown when moist, becoming pale ochraceous when dry; gills purple-brown; stem 4–6 in. long, whitish, silvery, shining, sometimes wavy.

Close to *P. elata*, differing in the more conical cap, and gills only slightly attached to the stem.

In grassy places, gardens, etc.

*P. glareosa*.—Cap campanulate, umbonate or obtuse, striate, very minutely tomentose, grey, apex pale chestnut; gills adnate, broad behind, umber; stem 1–2 in. long, slender, fistulose, brown with white fibrils.

Flesh brown, especially close to the gills.

On gravelly soil, after much rain.

*P. mastiger*.—Cap up to  $1\frac{1}{2}$  in. across, at first nearly cylindrical, then conico-campanulate and umbonate, usually wavy, dark brown, dingy ochre when dry; gills umber, edge pale; stem about 3 in. high, white.

Known by the prominent umbo.

Among grass on roadsides, etc.



*P. corrugis*.—Cap 1–2 in. across, campanulate, umbonate, radially wrinkled, pale ochraceous, often tinged pink; gills violet-black; stem 2–3 in. long, smooth, white.

In gardens and pastures.

*P. gyroflexa*.—Cap about  $\frac{2}{3}$  in. across, conico-campanulate, striate half-way up, atomate, soon pale grey, disc tawny; gills greyish purple; stem  $1\frac{1}{2}$ –2 in. long, white, wavy.

Distinguished by the striate cap and wavy stem.

Among grass. In small clusters or scattered.

\*\* *Cap campanulato-convex, then expanded, smooth or atomate; veil absent.*

*P. spadiceo-grisea*.—Cap 1– $1\frac{1}{2}$  in. across, conical, then campanulate, finally expanded, striate to the middle, bay, then greyish; gills brownish; stem  $1\frac{1}{2}$ –2 in. long, usually curved, shining white.

On chips, trunks, etc.

*P. obtusata*.—Cap up to  $\frac{2}{3}$  in. across, broadly bell-shaped, corrugated, obtuse, umber, paler when dry; gills pale, then umber; stem  $1\frac{1}{2}$ –2 in. long, whitish.

On trunks and the ground. Solitary or tufted.

*P. neglecta*.—Cap about  $\frac{1}{4}$  in. across, convex, then almost plane, ochraceous, atomate and almost white when dry; gills purple-brown; stem 1 in. long, slender, wavy, white.

On the ground.

\*\*\* *Cap and stem at first floccose or fibrillose.*

*P. frustulenta*.—Cap about 1 in. across, campanulate, then hemispherical, obtuse, slightly striate, slightly tinged brown with whitish squamules near the edge; gills whitish, then watery cinnamon; stem about 2 in. long, rather wavy, flocculose, white.

Exceptional in the rusty brown spores, but nearer to the present genus than to *Galera*.

Among gravel in damp places.

*P. bifrons*.—Cap up to  $\frac{3}{4}$  in. across, campanulate, yellowish brown, then tinged pink, pale when dry; gills pinkish grey, edge white; stem 2–3 in. long, smooth, whitish.

On twigs, chips, etc.

*P. semivestita*.—Cap up to  $\frac{3}{4}$  in. across, ovate-campanulate, bay-brown, becoming pale, when young sprinkled up to the middle with white fibrils; gills greyish, then umber; stem about  $2\frac{1}{2}$  in. high, silky white, fibrillose below.

Among grass. Tufted or solitary.

*P. fatua*.—Cap about 1 in. across, ovate-campanulate, then expanded and wrinkled, dingy ochre, disc darker, becoming pale; gills pale brown; stem 2–4 in. long, white, apex mealy.

On the ground. Very fragile. Suggests *Hypholoma appendiculatum*, but does not grow on wood.

*P. fibrillosa*.—Cap up to  $1\frac{1}{2}$  in. across, campanulato-convex, then expanded, minutely striate, livid, then whitish, at first fibrillose; gills blackish purple; stem about 2 in. long, white, fibrillosely squamulose.

In woods on the ground or on fallen rotten branches.

*P. gordonii*.—Densely tufted. Cap up to  $1\frac{3}{4}$  in. across, campanulate, grey, then whitish, edge grooved, sprinkled with white floccose scales; gills grey; stem about 2 in. high, white, transversely undulate, mealy above, floccose below.

Smell strong, unpleasant. When young the whole plant is covered with white floccose fibrils.

*P. helobius*.—Cap about  $1\frac{1}{2}$  in. across, conico-campanulate, becoming almost flat and with concentric, elevated ridges, radially wrinkled, subumbonate, sooty brown, then pale with a reddish tinge; gills sooty brown; stem reddish amber, with fugacious squamules, paler when dry.

Damp ground in woods.

*P. pennata*.—Cap about 1 in. across, campanulate, ochraceous, disc brownish, at first covered with white, feathery squamules; gills blackish brown; stem about 2 in. long, silvery white.

On naked soil.

*P. gossypina*.—Cap up to 1 in. across, campanulate, then expanded, dingy pale ochraceous, downy, then smooth, edge striate; gills white, then brownish black; stem about 2 in. long, whitish, downy, sometimes rather wavy.

Often somewhat tufted. Distinguished from *Psathyra pennata* by striate edge of cap.

In woods on the ground, fragments of wood, etc.

*P. noli-tangere*.—Cap up to  $\frac{3}{4}$  in. across, bell-shaped, then expanded, everywhere striate, pale amber, paler when dry, squamulose about the edge; gills broad, pale brown; stem about  $1\frac{1}{2}$  in. long, pale amber.

Every part pale amber when moist, cap becoming paler when dry. Very fragile.

Among chips, etc.

*P. microrhiza*.—Cap about 1 in. across, bell-shaped, shining with sparkling atoms, at first with yellow hair-like fibrils; gills pale, then blackish brown; stem about 2 in. long, whitish, silky, narrowed into a rooting base.

Gregarious, everywhere flocculose at first, fragile. Sometimes very small. Known best by the tapering rooting stem.

Among grass.

*P. urticæcola*.—Cap 2–3 lines across, bell-shaped, whitish, flocculent; gills white, then chocolate; stem  $\frac{1}{2}$ –1 in. long, flocculent, white.

Known by its small size and white colour.

On dead nettle stems.



## PLATE XXV

- |     |          |               |
|-----|----------|---------------|
| 1.  | COPRINUS | ATRAMENTARIUS |
| 2.  | „        | STERCORARIUS  |
| 3.  | „        | NIVEUS        |
| 4.  | „        | RADIATUS      |
| 5.  | „        | STERQUILINUS  |
| 6.  | „        | CONGREGATUS   |
| 7.  | „        | FIMETARIUS    |
| 8.  | „        | FUSCESCENS    |
| 9.  | „        | PICACEUS      |
| 10. | „        | MICACEUS      |



PLATE XXV.





## PSILOCYBE

Cap regular, smooth, edge at first incurved ; gills and spores at length brownish or purplish ; stem central, often rooting.

Differs from *Psathyra* by having the edge of the cap incurved when young, and from *Agaricus* and *Stropharia* by the absence of a ring.

1. *Cap with a pellicle that is viscid when moist ; stem firm, tough, often coloured.*

\* *Gills broadest in the middle, not decurrent.*

*P. sarcocephala*.—Cap 2-4 in. across, fleshy, convex, then expanded, dry, pale tawny, becoming pale ; gills adnate, very broad, greyish flesh-colour, then sooty ; stem 3-5 in. long, usually curved or wavy, whitish.

Distinguished from every other species of the genus by its large size and fleshy cap.

Round stumps, etc. Clustered or solitary.

*P. ericæa*.—Cap up to 1½ in. across, conico-convex, then expanded, then plane or depressed, viscid when moist, rusty or bay, pale yellowish and shining when dry ; gills adnate, pallid, then black ; stem 3-4 in. long, usually wavy, tough, pallid.

In damp or swampy pastures. Gregarious.

*P. subericæa*.—Cap 1-2 in. across, soon plane, even, brown, then pale ; gills sinuate, adnexed, pallid, then blackish ; stem 1-2 in. long, smooth, yellowish, distinctly hollow.

Differs from *P. ericæus* in the adnexed, sinuate gills and yellowish, hollow stem.

In grass fields.

*P. udus*.—Cap up to 1 in. across, convex, then plane, wrinkled, tawny bay, then yellowish ; gills whitish, then purplish ; stem 3-5 in. long, fibrillose, pale above, rusty below.

In swamps among *Sphagnum*, etc.

*P. canofaciens*.—Cap up to 1 in. across, bell-shaped, then expanded, with a fleshy disc, bay-brown, everywhere covered with delicate white fibrils which soon disappear at the disc, veil white, at first attached to the edge of the cap ; gills umber ; stem 2-3 in. long, colour of cap and covered with white fibrils.

On rotten straw.

*P. areolata*.—Cap 1-3 in. across, convex, then expanded, minutely fibrillose, breaking up into angular patches, ochraceous or rufous ; gills blackish with a purple tinge, edge whitish ; stem 2-3 in. long, dingy white, fibrillose.

On the ground in gardens, etc. Tufted.

*P. virescens*.—Cap up to 1½ in. across, convex, then expanded, bright dark brown, cracked into angular patches, the interstices clear pale green, then yellowish ; stem about 2 in. long, upper part



pale green and striate, rusty below ; gills pallid, then smoky purple.

Differs from *P. areolata* in the green colour on cap and stem, in being solitary, and in growing on wood.

On rotten stumps, chips, etc.

*P. agraria*.—Cap about  $\frac{3}{4}$  in. across, soon expanded, whitish, becoming grey, subumbonate, sulcate ; gills distant, broad, grey ; stem about  $2\frac{1}{2}$  in. long, thin, wavy, white.

About the roots of decayed trees.

*P. chondroderma*.—Cap about 1 in. across, campanulate, dark bright brown, fragments of the veil on the edge ; gills dark brown, edge white ; stem  $2\frac{1}{2}$ –3 in. long, paler than the cap, base squamulose.

In pine woods.

*P. scobicola*.—Cap up to  $1\frac{1}{2}$  in. across, convex, umbilicate, smooth, white ; gills brown with a red tinge ; stem about  $1\frac{1}{2}$  in. long, fibrillose, whitish.

Distinguished in the genus by the umbilicate cap.

On dead branches, sawdust, etc.

\*\* *Gills very broad behind, subdecurrent.*

*P. ammophila*.—Cap  $\frac{3}{4}$ –1 in. across, becoming expanded and umbonate, yellowish brown ; gills dusky, powdered with the black spores ; stem about 2 in. long, lower half clavate and sunk in the sand, white.

Remarkable for the lower half of the stem being thickly matted with mycelium, and sunk in the sand in which the fungus grows.

*P. coprophila*.—Cap about  $\frac{3}{4}$  in. across, becoming expanded and umbonate, yellowish rufous ; gills rather decurrent, livid brown ; stem 1–2 in. long, at first short and floccose, then elongated and smooth, whitish.

When very young the cap is covered with superficial squamules which soon completely disappear.

On dung and in pastures among grass.

*P. bullacea*.—Cap up to  $\frac{2}{3}$  in. across, soon expanded and umbonate, pale brown, striate, yellowish and silky when dry ; gills broad, brown, then blackish umber ; stem about 1 in. long, brownish with white down.

Differs from *P. bullacea* in the striate cap.

On dung and rich soil. Gregarious.

*P. physaloides*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, campanulate, then expanded and subumbonate, often depressed round the umbo, rather viscid, purple-brown, then paler ; gills slightly decurrent, rusty brown ; stem about 1 in. long, pale, base rusty.

Differs from *P. bullacea* in the purple-brown cap.

On the ground, among moss, also on dung.

*P. nuciseda*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, obsoletely umbonate, pale brown, yellowish when dry ; gills broad, brown, then blackish umber ; stem about 1 in. long, brownish with white down.

On fallen involucre of beech, fragments of wood, etc.

*P. atro-rufa*.—Cap up to 1 in. across, becoming expanded, dark rufous or purple-brown, paler when dry ; gills subdecurrent, umber ; stem 2–3 in. long, pale bay, then whitish.

On the ground in woods.

\*\*\* *Gills very narrow.*

*P. compta*.—Cap up to  $1\frac{1}{4}$  in. across, expanded and subumbonate, striate, edge broken, pale ochre and atomate when dry ; umber with a rosy tinge ; stem about 2 in. high, wavy, silky and shining.

Our only pale *Psilocybe* with a subumbonate, striate cap.

In woods among grass.

*P. semilanceata* (Pl. XXIV, fig. 2).—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, acutely conical, umbo often pointed, slightly viscid when moist, tinged yellow or blue-green when dry ; gills blackish with purple tinge, edge pale ; stem 2–3 in. long, wavy, shining, pallid.

Distinguished by the sharp-pointed cap.

Among grass in pastures. Gregarious. Common.

var. *cærulescens*.—Base of stem greenish blue.

2. *Cap without a viscid pellicle, often splitting, hygrophaneous ; gills adnexed, rarely adnate ; stem rigid.*

*P. cano-brunnea*.—Cap 2–3 in. across, convex, then plane, fleshy brown, pale when dry ; gills almost free, purple-brown ; stem about 2 in. high, squamulose, whitish, rooting.

On naked or scorched ground.

*P. spadicea*.—Tufted. Cap 1–3 in. across, soon almost plane, bay-brown when moist, pallid when dry ; gills dry, crowded, pale, then rosy brown ; stem 2–4 in. long, equal, whitish.

At the base of trunks, among dead leaves, etc.

var. *hygrophilus*.—Large. Cap brown, then dingy ochre ; gills with a long decurrent line down the stem ; stem 4–6 in. long, fusiform and rooting.

At roots of trees in damp places.

var. *polycephalus*.—Densely crowded ; stems thin, wavy ; cap coloured as in typical form.

Forming large, dense tufts at the roots of trees, etc. Distinguished from *Hypholoma appendiculatum* by the entire absence of a veil.

*P. squalens*.—Cap 1–2 in. across, convex, then plane, smooth, lurid, then pale ; gills adnato-decurrent, crowded, brown ; stem about 2 in. long, nearly colour of cap, apex striate.

On and near trunks. Solitary or tufted.



*P. cernua*.—Cap up to 1 in. across, campanulato-convex, then more or less expanded, pallid, wrinkled when dry; gills greyish white, then dark brown; stem 2–4 in. long, white, wavy.

On the ground, heaps of dead leaves, etc. Usually tufted.

*P. hebes*.—Cap up to 1 in. across, soon expanded, edge finely striate, lurid, pale when dry; gills cut out behind so as to be almost triangular, brown; stem about 1 in. long, whitish.

Cap lurid, that is, a dingy, obscure olive-colour.

On trunks, heaps of leaves, etc.

*P. fænisecii*.—Cap up to 1 in. across, soon more or less expanded, obtuse, dingy brown with a rufous tinge, pale when dry; gills adnate, ventricose, broad, umber-brown; stem 2–3 in. long, brownish, then pale.

Superficially resembling *Panæolus papilionaceus*, but differing in the umber gills and spores.

Among short grass in fields, lawns. Common.

*P. clivensis*.—Cap about 1 in. across, pale brown, then almost white, atomate, striate; gills broad, umber edge, white; stem about 1½ in. long, silky, base swollen.

On the ground.

*P. catervata*.—Densely clustered. Cap up to ⅔ in. across, campanulate, snow-white; gills brown with a purple tinge, edge white; stem about 2 in. long, shining white.

On the ground.

#### COPRINUS

Pileus with a central stem, flesh usually thin, often membranaceous, usually grooved or striate, often downy or scurfy, sometimes covered with sparkling particles; gills at first closely in contact, usually dissolving into a black, dripping fluid; spores black; stem hollow, volva and ring present in some species.

A very natural genus, characterized by the usually deliquescent gills and ephemeral existence. The majority grow on dung or rich ground.

1. *Cap with a distinct cuticle; gills deliquescing at maturity.*

\* *Ring present on stem (at least, when young), formed by the free edge of the volva. Cuticle of cap torn into scales.*

*C. comatus* (Pl. XXIV, fig. 3) (parasol mushroom).—Cap 3–6 in. high, cylindrical, then more or less expanded at the edge, at first smooth, ochraceous, the cuticle becoming broken up into patch-like scales and exposing the white flesh; gills crowded, white, then the edge becomes rosy, finally black and deliquescent; stem 4–9 in. long, silky, white, hollow, bulbous, ring movable.

Gregarious. Esculent.

Among grass in pastures; often on waste ground.

*C. ovatus*.—Cap ovate, then expanded, 2-4 in. high, at first covered with a pale ochraceous cuticle which becomes broken up into concentric rows of scales, edge striate; gills whitish, then blackish umber; stem 3-5 in. long, white, bulbous; ring soon disappearing.

Differs from *C. comatus* in its smaller size, striate edge of cap, concentrically arranged scales and fugacious ring.

In pastures.

*C. sterquilinus* (Pl. XXV, fig. 5).—Cap conical, about 2 in. across when expanded, coarsely grooved, at first silky, disc with erect squamules, silvery grey, disc tinged brown, thin; gills free, pale, then purple-umber; stem 4-6 in. high, white, fibrillose, base thickened, sheathed by the volva for about an inch from the base, margin of volva ending in a free margin.

Known by the squamulose disc of the cap, and the sheathing volva.

On dung.

*C. oblectus*.—Cap 1 in. or more across, cylindrical, then conico-campanulate, whitish and silky, then smooth and pale tan-colour, grooved, powdered with rosy meal; gills narrow, becoming blackish with a tinge of flesh-colour; stem silky, white, with a short adhering volva having a free, reflexed edge.

Distinguished by the rosy meal on the cap.

On dung, etc.

*C. umbrinus*.—At first entirely enclosed in a white volva. Cap conico-hemispherical, soon almost plane, coarsely grooved up to the disc, about 2 in. across, ornamented with patches of the volva; gills free; stem 4-5 in. long, dark umber from the first, base bulbous, with a persistent white volva having a free, reflexed edge.

Readily distinguished from its nearest ally, *C. stenocoleus*, by the sulcate cap and umber stem.

On manured ground.

*C. squamosus*.—Cap thin, ovoid, then expanded, grey, covered with reddish brown scales, about 1 in. high, up to 2½ in. across when expanded; gills free, ventricose; stem 4-6 in. long, smooth and white above the ring, covered with reddish brown scales below.

Readily known by the scaly cap and lower part of stem.

At the base of trees, stumps, etc. Tufted.

*C. volvaceominimus*.—Cap campanulate, then expanded, striate, grey with white squamules, up to ¼ in. across; gills slightly adnexed, narrow, blackish purple; stem smooth, hyaline, base bulbous, up to 1 in. long, volva with a broad, free margin.

A minute species, differing from *C. hendersonii* in having a distinct volva and subglobose spores; *C. bulbillosus* differs in the absence of a marginate volva.



*C. dilectus*.—Cap cylindrical, then campanulate, often becoming revolute, finely striate, rosy, then tawny, mealy or floccose, about  $\frac{1}{4}$  in. across, sometimes more; gills free, reddish brown, then black; stem about 2 in. long, whitish and sprinkled with red or deep orange powder, slightly bulbous; volva reduced to whitish squamules or down.

On scorched ground, soil in plant-pots, on rotten twigs, etc.

*C. roseotinctus*.—Cap cylindrical, eventually revolute, silky, striate, brownish, densely covered with rose-coloured meal, about  $\frac{1}{4}$  in. across; gills adnexed, broad, deliquescent; stem bulbous and white floccose, densely covered with rose-coloured meal when young, about 1 in. long.

Known by the deep rose-coloured meal on cap and stem. It is very doubtful whether this is distinct as a species from *C. dilectus*.

On the ground.

\*\* *Ring imperfect, no sheathing volva, squamules on cap minute, adpressed.*

*C. atramentarius* (Pl. XXV, fig. 1).—Tufted. Cap 2–3 in. high and same when expanded, often plicate and lobed at the edge, greyish, silky, disc or centre brownish and minutely rough; gills free, crowded, white, then black with purple tinge; stem 4–6 in. high, white, silky, shining, ring near the base evanescent.

There is a prominent ridge near the base of the stem, due to pressure of edge of cap when young. Edible when young.

About decaying stumps and on rich soil. Not on dung.

*C. soboliferus*.—Close to *C. atramentarius*, differing mainly in the cap being truncate or flattish at the apex, and there covered with distinct squamules.

Near trunks, buried wood, etc.

*C. fuscescens* (Pl. XXV, fig. 8).—Cap 1–1 $\frac{1}{4}$  in. across, ovate-expanded, disc brownish, even or broken up into squamules, the remainder greyish brown; gills attached to stem, blackish umber; stem 4–5 in. long, whitish, ring indistinct or absent.

Differs from *C. atramentarius* in smaller size and brownish grey cap.

On trunks and stumps.

var. *rimososquamosus*.—Cuticle of cap torn into large angular patches, showing the paler flesh.

\*\*\* *Universal veil flocculose or felty, at first continuous, then broken into patches by the expansion of the cap, on which the patches remain.*

*C. picaceus* (Pl. XXV, fig. 9) (magpie toadstool).—Cap 2–2 $\frac{1}{2}$  in. across, ovate-campanulate, striate, smoky black variegated with irregular, superficial white patches; gills free, greyish black; stem 5–6 in. long, white, smooth.

When young the cap is cylindrical and snow-white, due to

the continuous veil, which is broken up into patches as the cap expands.

On the ground. Rare.

*C. aphthosus*.—Cap about 1 in. high, and broad, very thin, ovate-campanulate, not striate, at first covered with floccose scales, then naked, pallid; gills becoming black; stem about 2 in. high, white, fibrillose, often twisted.

In hollow trunks.

var. *boltoni*.—Cap wavy, tinged olive.

*C. flocculosus*.—Cap 2–3 in. across, very thin, ovate, then expanded, dingy white, striate, covered with adpressed scales, splitting; gills free, tinged violet, then brownish black; stem up to 3 in. high, white, silky.

In fields and gardens. Solitary or tufted.

*C. similis*.—Cap ovate-campanulate, pallid, disc darker, with fine line-striations, apex with brown-tipped, sharp warts which soon disappear; gills blackish, edge brown; stem white.

Differs from *C. aphthosus* in striate cap.

On trunks of dead trees.

\*\*\*\* Cap at first covered by a downy web-like weft that becomes torn into scales, which soon disappear.

*C. extensorius*.—Cap 1½–2 in. across when expanded, thin, cylindric-clavate, then campanulate, striate, at first with evanescent scales, whitish, apex tinged brown; gills becoming brownish black; stem 4–5 in. long, smooth, white.

Cap splitting, but edge not turning up. Scales disappearing in order from apex to edge of cap.

On the ground about the roots of trees, etc.

*C. fimetarius* (Pl. XXV, fig. 7).—Cap 1–2 in. across, clavate, then conico-expanded, soon split and revolute or upturned, greyish, apex brownish, grooved, at first covered with white scales; gills black; stem 5–6 in. high, squamulose, white.

Soon becoming split, upturned, and deliquescing. Scales disappear in order from edge of cap to the apex.

On manure heaps. Often clustered.

var. *pullatus*.—Cap dusky, then blackish. Stem soon smooth.

var. *cinereus*.—Cap mealy, then naked, ashy grey.

var. *macrorrhiza*.—Cap at first with feathery squamules; stem short, with a long rooting base.

All grow on manure or rich soil.

*C. tomentosus*.—Cap 1–1½ in. high, cylindrical, then conical, striate, tomentose or velvety, pale grey, the tomentum becoming torn into scales, splitting; gills blackish brown; stem about 2 in. long, velvety, greyish.

On dung and on manured ground.



*C. niveus* (Pl. XXV, fig. 3).—Cap  $\frac{1}{2}$ –1 in. across, elliptical, then campanulate, covered with snow-white down ; gills blackish ; stem 1–3 in. high, white, downy.

Distinguished by the snow-white cap and stem, and by its small size. *C. narcoticus* differs in its strong smell.

On horse dung.

*C. cothurnatus*.—Cap about 1 in. across, campanulate, then expanded, very scurfy, becoming umbonate and splitting, reddish white ; gills flesh-colour, then blackish ; stem about 2 in. long, white, squamulose, base with a squamulose sheath.

On cow dung.

\*\*\*\*\* Cap at first covered with glistening particles which at length disappear.

*C. micaceus* (Pl. XXV, fig. 10).—Tufted. Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, thin, elliptical, then campanulate or bell-shaped, coarsely striate, edge wavy or lobed, ochraceous tan, disc even, darker, entirely covered when young with sparkling granules which become washed off ; gills becoming black ; stem silky, whitish.

Distinguished by the crowded habit and the glistening particles on the cap.

About stumps, posts, and on rotten wood.

*C. aratus*.—Cap 2–3 in. across, campanulate, then expanded, dusky, deeply grooved up to the wrinkled disc, sprinkled with large glistening particles ; gills narrow, brown, then black ; stem 4–5 in. high, silky, white, dark inside.

Differs from *C. micaceus* in umber colour and larger size.

In hollow trunks, on the ground, etc. Solitary or tufted.

*C. radians*.—Cap 1–2 in. across, ovate-campanulate, glistening with minute particles, disc minutely squamulose, yellowish tawny, then paler ; gills becoming violet-black ; stem 1– $1\frac{1}{2}$  in. long, whitish.

On damp, plastered walls, etc.

*C. papillatus*.—Cap  $\frac{1}{2}$ –1 in. across, elliptical, then bell-shaped, splitting, then plane or upturned, striate, greyish scurfy, disc rough ; gills black ; stem about 1 in. long, white and hyaline.

On dung and on the ground.

\*\*\*\*\* Cap smooth from the first ; no trace of down nor glistening particles.

*C. alternatus*.—Cap up to 1 in. across, up to 2 in. when expanded and umbonate, smooth, striate, chalky or tinged buff, disc darker ; gills becoming black ; stem 3–4 in. long, whitish, smooth.

In small clusters on the ground.

*C. deliquescent*.—Cap  $1\frac{1}{2}$ –3 in. across, ovate-campanulate, expanded and wavy, striate, smooth except the papillose disc, grey or smoky, disc often rufescent ; gills grey, then blackish ; stem 3–4 in. high, whitish, smooth.

Differs from *C. atramentarius* in smaller size, and free, distant gills.

In small tufts on trunks, stumps, heaps of dead leaves, etc.

*C. tardus*.—Cap 1–2 in. high and wide, campanulate, grooved, smooth, brown, then paler; gills very narrow, blackish; stem 4–6 in. high, whitish, slightly wavy.

Densely tufted. Differs from *C. deliquescens* in the smooth disc.

*C. digitalis*.—Tufted. Cap about 1 in. high and broad, thimble-shaped, striate, smooth, straw-colour; stem 1–5 in. long, wavy, white.

In damp places in woods. Tufted.

*C. congregatus* (Pl. XXV, fig. 6).—Densely tufted. Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. high, cylindrical, then bell-shaped, then expanded and splitting, slightly striate, smooth, viscid, ochraceous; gills becoming black; stem 1–1 $\frac{1}{2}$  in. long, smooth, whitish.

Distinguished by densely tufted habit and viscid, smooth, ochraceous cap.

On the ground, in hot-houses, etc.

2. Cap very thin, smooth, without a cuticle, grooved, splitting along the lines of the gills.

\* Stem with a ring which is sometimes formed from the free edge of the volva.

*C. hendersoni*.—Cap about 2 lines high, up to  $\frac{1}{3}$  in. across when expanded, subcylindrical, then almost plane, pruinose, apex pale brown, remainder greyish; gills free, black, edge white; stem 1–1 $\frac{1}{2}$  in. long, white, with a distinct ring.

On hotbeds and dung. Very tender.

*C. bresadolæ*.—Cap subcylindrical, greyish white, apex tinged brown,  $\frac{1}{2}$ – $\frac{2}{3}$  in. high; gills black, edge white; stem up to 4 in. long, tapering upwards, furnished with a loose, deciduous ring, white, smooth.

Always expands at night, deliquescing almost as it expands. At first covered with a very thin, universal veil, which does not break up into squamules, but splits from apex to base, and disappears.

On wood. Gregarious.

*C. lagopus*.—Cap 1–2 in. across, cylindrical, then campanulate, covered with white down, becoming smooth, grooved, greyish, splitting, and turned up; gills free, black; stem 3–6 in. long, white, everywhere covered with white down.

Resembling *C. niveus* in appearance, but larger, and with a flocculent or downy stem.

On dung, rotten wood, etc.

*C. narcoticus*.—Cap  $\frac{1}{2}$ – $\frac{3}{4}$  in. across, cylindric-clavate, then expanded and revolute, at first covered with recurved white scales,



then naked and greyish white, striate ; gills blackish ; stem  $1\frac{1}{2}$ –2 in. long, covered with white down, becoming smooth.

Tufted. Smell very strong and unpleasant. Otherwise difficult to distinguish from *C. niveus*.

On dung.

*C. macrocephalus*.—Cap up to  $\frac{3}{4}$  in. across, cylindrical, then campanulato-expanded, ashy grey, disc brownish sprinkled with paler scales ; gills black ; stem  $1\frac{1}{2}$ –2 in. long, whitish, fibrillose.

Distinguished among the small grey species by the pointed squamules on the cap and fibrillose stem.

On dung.

*C. nycthemerus*.—Cap up to  $\frac{2}{3}$  in. across, conico-cylindrical, then expanded and splitting, grey, disc tawny, grooved, floccosely mealy ; gills narrow, blackish ; stem 2–3 in. long, whitish, smooth.

On dung and manured ground. Tufted.

*C. radiatus* (Pl. XXV, fig. 4).—Cap 2–3 lines across, cylindrical, then campanulate, becoming flat, soon splitting, grooved, yellowish, disc tawny, at first covered with greyish down ; gills blackish ; stem  $\frac{1}{4}$ –1 in. long, whitish.

Very ephemeral. Known by its minute size and flat, split cap.

On horse dung, often in cavities or on the under side. Very common.

*C. cordisporus*.—Cap cylindric-ovate, then expanded and upturned, very thin, grooved, edge crenate, whitish or tinged ochraceous, disc scurfy and tawny, 2–3 lines across ; gills free, rather narrow ; stem hair-like, smooth, even, whitish and hyaline, base densely strigoso-squamulose, up to  $\frac{1}{2}$  in. long (spores heart-shaped, compressed, blackish).

Readily distinguished amongst the very minute species by the compressed, heart-shaped spores.

On dung of various animals.

*C. gibbsii*.—Cap hemispherical, then expanded, striate, smooth, and minutely atomate or sparkling, pale buff or pale ochraceous, disc darker, 1–2 lines across ; gills adnate, few in number, 5–7 ; stem hair-like, white, and pellucid, polished, 3–4 lines long (spores circular, compressed).

Probably the smallest agaric known. Differs from *C. cordisporus* in its circular spores, and from *C. radiatus* in its smaller size and different spores.

On dung of horse, sheep, etc.

*C. spraguei*.—Cap up to  $\frac{3}{4}$  in. across, conical, then expanded and upturned, downy, greyish, disc tawny, grooved ; gills few, becoming blackish ; stem  $1\frac{1}{2}$ –2 in. high, smooth, pale cinnamon.

Known by the coloured stem.

On the ground.

\*\*\* *Cap with glistening particles or scurfy ; gills usually fixed to a collar round the stem ; ring absent.*

*C. domesticus*.—Cap  $1\frac{1}{2}$ –2 in. across, ovate, then bell-shaped, scurfy, pale grey, disc brown, grooved ; gills becoming blackish brown ; stem 2–3 in. long, white, silky.

Very brittle, often tufted. Gills ruddy when young.

On wet, rotten wood, damp carpets, walls, etc.

*C. stercorarius* (Pl. XXV, fig. 2).—Cap  $1$ – $1\frac{1}{2}$  in. broad when expanded, densely covered with white, glistening meal, striate ; gills black ; stem at first ovate, then elongating to 3–5 in., white.

Differs from *C. niveus* in larger size, and in the cap being covered with glistening meal, and not down.

On dung and manured ground.

*C. ephemerus*.—Cap up to  $\frac{3}{4}$  in. across, expanding and splitting, grooved, scurfy, disc elevated, rufescent ; gills narrow, blackish ; stem up to  $2\frac{1}{2}$  inches long, smooth, whitish, pellucid.

Distinguished from *C. plicatilis* by the disc being prominent, and not depressed. Very fugacious.

On dunghills, manured ground, etc.

*C. sociatus*.—Cap up to  $1\frac{1}{2}$  in. broad when expanded, grooved, mealy, brown, then pale, disc umber, at length depressed ; gills greyish black ; stem about 2 in. long, smooth, white.

Damp ground, on walls, etc.

*C. plicatilis*.—Cap up to 1 in. across, ovate-cylindrical, becoming flat, edge splitting and becoming upturned, almost smooth, brown, then grey, disc dark and becoming depressed ; gills greyish black ; stem 2–3 in. long, smooth, white.

Known by the deeply grooved cap becoming flat, and the brown, sunken disc.

Common among short grass.

*C. velox*.—Cap obovate, striate, then grooved, scurfy between the ribs, disc also scurfy and greyish, 1–2 lines broad ; gills close to the stem ; stem up to 1 in. long, entirely covered with delicate, white, floccose down, base with radiating fibrils.

On cow dung.

*C. platypus*.—Cap 2–3 lines across, convex or campanulate, then expanded, white, then ochraceous flocculose ; gills free, narrow, distant, becoming black ; stem about  $1\frac{1}{4}$  in. long, very slender, even, whitish, base discoid.

Remarkable for the flattened, discoid base of the stem, which resembles that of some of the minute species of *Mycena*.

On a palm stem in a conservatory. In all probability an introduced species.

*C. filiformis*.—Cap 1–2 lines high, grey, cylindrical, striate, atomate ; stem  $\frac{1}{2}$ – $\frac{3}{4}$  in. high, very thin, white, sparingly fibrillose ; gills linear.



## PLATE XXVI

1. *HYPHOLOMA APPENDICULATUM*
2. *BOLBITIUS APICALIS*
3.     ,,         *FRAGILIS*
4. *PANÆOLUS RETIRUGIS*
5. SECTION THROUGH CAP OF FIG. 4
6. *PAXILLUS INVOLUTUS*
7. *PSATHYRA ELATA*
8. SECTION THROUGH CAP OF FIG. 7
9. *PSATHYRELLA HIASCENS*
10. SECTION THROUGH CAP OF FIG. 9
11. *HYPHOLOMA FASCICULARE*



PLATE XXVI.





Specimens sometimes occur slightly larger than described above, but agreeing in every other respect.

On damp ground in woods.

\*\*\*\* *Cap smooth from the first, ring absent.*

*C. hemerobius*.—Cap  $\frac{2}{3}$ –1 in. across, ovate-campanulate, then expanded, coarsely sulcate up to obtuse disc, smooth from the first, bay-brown flesh very thin, splitting; gills narrow, attached to an obscure collar, pale, then black; stem  $2\frac{1}{2}$ –3 in. long, thinner upwards, smooth, even, hollow, whitish.

*C. plicatilis*, a closely allied species, but generally somewhat smaller, is distinguished by the disc becoming depressed, and the gills distant from the stem, and attached to a distinct collar. In rich pastures, roadsides, woods, etc.

*C. stellaris*.—Cap ovoid, then campanulate, striate, snow-white, becoming greyish, disc covered with minute pellucid vesicles, about 1 line across; gills adnate; stem about  $\frac{1}{2}$  in. long, pellucid, velvety, with slender, colourless hairs.

On the under side of cow dung, etc.

*C. tuberosus*.—Cap elliptical, then campanulate, finely striate, white, then greyish, veil formed of hyaline vesicles, 1–2 lines high; gills blackish violet; stem  $\frac{2}{3}$ – $1\frac{1}{2}$  in. long, very slender, often slightly wavy, white, downy, springing from a small black sclerotium.

Somewhat resembling *C. niveus*, but smaller, and differing in springing from a sclerotium. So far as I am aware, the only British specimens were found at Kew. The small black sclerotia, not much larger than a turnip seed, were found in dung. These were placed in damp sand, and in due course gave origin to the fungus, one sporophore springing from each sclerotium.

On dung or decaying vegetable matter.

#### Family POLYPORACEÆ

In this family the hymenium lines the cavities of tubes closely packed side by side, the pores or open ends of the tubes, through which the spores escape, forming the exposed surface of the hymenium. In the higher forms, as *Boletus*, *Fomes*, etc., the tubes are often quite long, half an inch, or in some instances an inch or more in length. From this condition of things, as we pass from the most highly organized genera to the simplest, the tubes become gradually shorter and less perfect in structure, until, in the genus *Merulius*, the tubes are reduced to exceedingly shallow pits, which appear to be due simply to anastomosing wrinkles on the hymenial surface. At this point the family merges into the family Hydnaceæ, through the genus *Phlebia*. The general build and structure of the various species included in the Polyporaceæ is very diversified. In *Boletus* we have a symmetrical, very fleshy cap, supported on a stout



central stem, resembling an agaric in general appearance, but differing in having tubes on the under surface of the cap, instead of gills. In *Polyporus* we meet with species having a lateral stem; in *Fomes* the stem is altogether absent; whereas in *Poria* and *Merulius* the entire fungus is reduced to a thin layer, adhering by its entire under surface to the substratum, and the upper or free surface, consisting entirely of the porous hymenium. In general consistency there is equal diversity, some being soft and fleshy, others hard and woody. Some are perennial. Practically all the species grow on wood.

#### KEY TO THE GENERA

Cap regular, fleshy, hymenium on the under surface, the tubes easily removed from the flesh of the cap; stem central, stout. Spores elongated. *Boletus*.

General structure as in *Boletus*, but the cap is covered with large, shaggy scales, and the spores are globose. *Strobilomyces*.

Cap very fleshy, soft, sessile, and attached by the edge, tubes crowded side by side, but distinct from each other. *Fistulina*.

Stratum of tubes sharply defined from the flesh of the cap, but not separable from it; fleshy and tough; stem central, lateral or absent altogether, and attached by a broad base. *Polyporus*.

Perennial. Woody, sessile, horizontal, and attached by a broad base; tubes stratified, or consisting of two or more superposed layers. *Fomes*.

Cap quite thin, limp, velvety or downy; tubes quite short. *Polystictus*.

Entirely adnate to the substratum, thin, pores uppermost. *Poria*.

Tubes immersed at various depths into the flesh of the cap; cap corky, sessile and attached by a broad base. Often fragrant. *Trametes*.

Cap tough and corky, attached by a broad base; pores often long and irregularly wavy, dissepiments or walls of the tubes thick, corky, elastic. *Dædalea*.

Subgelatinous. Thin and adnate to the substratum; pores very shallow, often wavy. *Merulius*.

#### NOTES ON THE GENERA

##### BOLETUS

The cap is always symmetrical, and usually very fleshy, and bears the porous hymenium on its under surface. Stem central, stout. The colours are often very bright, the cap is sometimes minutely velvety, but never scaly. In some species the white or yellow flesh changes to a deep blue colour when broken and exposed to the air. All the species grow on the ground, and many appear during the summer season. Some are edible.

## STROBILOMYCES

The one British species included in this genus is somewhat rare and local in its distribution. The general structure is that of *Boletus*, differing mainly in the coarsely scaly cap, and globose spores.

## FISTULINA

The one British species is known as the "beef-steak fungus," on account of the appearance of the thick, succulent flesh of the cap when seen in section. The fungus grows horizontally, and forms large, flattish, thick flaps, sometimes weighing several pounds, and somewhat resembles a large flap of raw liver in appearance. Edible, but toughish. Almost confined to old oak trunks in this country.

## POLYPORUS

Cap fleshy, tough, rather soft when growing ; stem central, lateral, or absent. Some of the species are very large, forming dense tufts at the base of stumps and on trunks. Cap never concentrically grooved nor zoned. Pores never stratified, that is, consisting of more than one layer.

## FOMES

Cap thick, hard and woody, often covered by a very hard cuticle or crust, usually concentrically grooved, never scaly nor velvety, smooth, usually brownish in colour, sessile with one exception, *Fomes lucidus*, which usually has a distinct lateral stem, that varies much in length. Tubes stratose, or composed of two or more superposed layers, which are sharply defined by a line, easily seen when a section of the hymenium is examined.

Several are injurious parasites on forest and fruit trees.

## POLYSTICTUS

Cap quite thin and pliant, silky or velvety, and usually marked with coloured concentric zones, sessile, growing horizontally, and usually attached by a somewhat narrowed base. Tubes very short, not stratose.

## PORIA

This genus includes a considerable assemblage of species, all of which form thin crusts on wood, twigs, etc., being attached by the entire under surface, the upper or free surface being covered by the porous hymenium. Some are probably only depauperized conditions of *Polystictus* or *Polyporus*.

## TRAMETES

A genus somewhat difficult to define. It resembles *Polyporus* or *Fomes* in general appearance, but differs in the tubes not all ending exactly at the same level where they join the flesh of the cap, but



join the flesh at different levels. Cap fleshy, semiorbicular, and attached by a broad base, corky or woody. Several of the species have a strong, spicy smell.

#### DÆDALEA

Cap corky or woody, sessile, and attached by a broad base, or entirely adnate to the substratum. Distinguished by the wavy, often very much elongated pores, which sometimes almost resemble gills. The walls or dissepiments of the tubes are often thick, corky, and tough.

#### MERULIUS

Mostly forming a thin, subgelatinous layer entirely attached to the substratum, in some species the margin is more or less free and reflexed. Hymenium consisting of very shallow, irregular, wavy pores. *Merulius lacrymans*, well known under the name of "dry rot," is very destructive to worked timber.

#### BOLETUS

Usually large, very fleshy fungi. Cap very thick, convex, even; stem central, stout, hymenium on the under surface of the cap, consisting of myriads of closely packed tubes, pores or open ends of tubes, circular, angular, or wavy. Mass of tubes readily separable from the flesh of the cap.

Amongst the largest of our terrestrial fungi, the cap of *B. edulis*, a typical species, has been aptly described as resembling in size, shape, and colour a penny bun. In some kinds the white or yellowish flesh instantly changes to a more or less intense blue colour when broken and exposed to the air. Distinguished from the fleshy forms of *Polyporus* by the mass of tubes readily separating in a clean, unbroken manner from the flesh of the cap. *Strobilomyces* is most closely related to *Boletus*, but is readily distinguished by the coarsely scaly cap and globose spores.

With one exception, all the species grow on the ground. Several are edible.

1. Surface of hymenium yellow, orange, greenish, or buff.

\* A ring present on the stem.

*B. luteus*.—Cap 3-4 in. across, thick, at first covered with a brown, very viscid substance, becoming dry and paler, flesh whitish, not changing colour; tubes about  $\frac{1}{4}$  in. long, yellow; stem 3-4 in. long, stout, yellow, rough with raised points above the large whitish ring.

On the ground in pine woods.

*B. elegans*.—Cap 2-4 in. across, almost plane, clear yellow or tawny golden, viscid, flesh not changing colour; tubes about  $\frac{1}{4}$  in. long, sulphur-yellow; stem 3-4 in. long, yellow, minutely dotted above the somewhat fugacious white ring.

In woods, especially larch.

*B. flavus*.—Cap 3–4 in. across, expanded, smooth, yellow, viscid, flesh pale yellow, unchangeable; pores large, angular, tubes about  $\frac{1}{4}$  in. long; stem 3–4 in. long, stout, dingy yellow, netted above the fragmentary ring.

Distinguished amongst the yellow species by the stem being covered with a vague network above the ring.

In woods.

*B. flavidus*.—Cap  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across, umbonate, then expanded and almost plane, dingy yellow; tubes about  $\frac{1}{4}$  in. long, running down the stem, pores rather large, angular, dingy yellow; stem 2–3 in. long, slender, ring viscid.

More slender than preceding species, and differing in the viscid ring.

In pine woods, swamps, etc.

\*\* *Cap not viscid, densely downy or silky, ring absent.*

*B. chrysenteron* (Pl. XXVII, fig. 3).—Cap 1–4 in. across, soon expanded, minutely tomentose, brownish with a decided olive tinge, becoming cracked and showing the red flesh in the cracks, flesh showing a little blue when broken; tubes yellow, then greenish, pores angular; stem fibrous, yellow, stained with red.

Perhaps our commonest species, known by the red colour of the cracks in the dingy olive cap.

In woods and pastures.

*B. subtomentosus*.—Very closely resembling *B. chrysenteron*, differing in the cracks in the olive cap being yellow instead of red. This coloration depends on the colour of the flesh just below the olive tomentum, hence in a section of the cap this line is red in one case and yellow in the other.

In woods.

*B. striæpes*.—Allied to the two previous species, differing in the presence of blackish stripes on the stem.

In pine woods.

*B. cruentus*.—Cap 3–4 in. across, resembling the three preceding species, differing in the cap becoming red at once when bruised, and in the tapering rooting stem, which also turns red when cut.

On the ground under beeches.

*B. sanguineus*.—A species respecting which little is known. The cap blood-red changing to red-brown, about 3 in. across; tubes yellow, blue when cut, stem yellow with crimson streaks.

In woods.

*B. impolitus*.—Cap 4–6 in. across, flocculose, pale yellow-brown or tawny brown; tubes nearly free from the stem, yellow; stem 2–3 in. long, stout, yellow, red above. Flesh tinged blue when cut.

In woods.



## PLATE XXVII

1. BOLETUS LURIDUS
2. SECTION THROUGH CAP AND TUBES OF FIG. 1, SHOWING  
THE BLUE COLORATION OF THE FLESH WHEN CUT
3. BOLETUS CHRYSENTERON
4. BOLETUS SCABER
5. CORYNE SARCOIDES
6. CYATHUS STRIATUS
7. HYDNUM REPANDUM
8. CALOCERA VISCOSA



PLATE XXVII.





*B. sulphureus*.—Cap 3–6 in. across, rather thin, downy, sulphur-yellow, flesh tinged blue when broken ; tubes yellow, then tinged green ; stem short, stout, yellow.

Growing in clusters from a dense golden yellow down. Caps wavy and growing into each other.

Among sawdust, chips, etc.

*B. variicolor*.—Cap about  $1\frac{1}{2}$  in. across, tomentose, olive, blackish purple under the down, edge incurved ; tubes about 2 lines long, yellow ; stem about 2 in. long, vaguely netted above, yellow with red streaks in parts.

In woods.

*B. olivaceus*.—Cap 2–3 in. across, edge incurved at first, smooth, brownish olive ; tubes 2–3 lines long ; stem thin above, becomes swollen below, yellow above, remainder crimson.

In woods.

*B. fragrans*.—Cap 1–4 in. across, dark brown, edge incurved, downy, flesh thick, yellowish, blue or greenish, then reddish when broken ; tubes almost free from stem,  $\frac{1}{2}$  in. long, greenish ; stem stout, with yellow and red portions.

Cap sometimes bronze-brown or with purple shades ; often grows in clusters.

In woods under oaks, etc.

*B. æstivalis*.—Cap 5–8 in. across, whitish or pale buff, edge often wavy ; tubes short round stem,  $\frac{1}{2}$  in. or more long, yellow ; stem 3 in. long, thick, more or less bulbous.

One of the largest species. Edible.

In pastures under trees, etc.

*B. fulvidus*.—Cap 2–3 in. across, silky-shining, firm, foxy brown ; tubes depressed round stem, white, then yellow, tinged olive when old ; stem stout, about 2 in. long, coloured like the cap.

On the ground under trees.

*B. castaneus*.—Much resembling *B. fulvidus*, but readily distinguished by the minutely velvety stem.

In woods.

*B. spadiceus*.—Cap 2–4 in. across, expanded, downy, bay-brown, often cracked ; tubes  $\frac{1}{4}$ – $\frac{2}{3}$  in. long, pores minute, yellow ; stem 2–3 in. long, narrowed upwards, scurfy, yellowish brown.

In woods. Solitary or in small clusters.

*B. vaccinus*.—Cap 2–4 in. across, minutely downy, deep chestnut-colour ; tubes almost free from stem, white, then yellow ; stem stout, paler than cap.

Differs from *B. badius* in downy, dry cap and minute pores. Often in small clusters.

In woods, especially under beeches.



*B. rostkovii*.—Cap 3–4 in. across, becoming almost plane, dingy olive-brown or rufous, minutely velvety, often cracking; flesh white, tinged red when cut, with a faint tinge of blue; tubes about  $\frac{1}{2}$  in. long, yellow-green, pores angular; stem obconic or tapering strongly downwards, about 1 in. long.

Known by the obconic stem, and the flesh becoming red.

Under trees.

*B. purpurascens*.—Cap 3–4 in. across, deep purple, tinged brown, flesh marbled dingy grey; tubes  $\frac{1}{2}$  in. or more long, dingy yellow, pores small, irregularly circular; stem about 2 in. long, tapering downwards to a rooting base, purple-red.

Differs from *B. purpureus* in the yellow pores.

In woods.

*B. radicans*.—Cap 3–4 in. across, velvety, greyish olive, becoming yellowish red; tubes about  $\frac{1}{4}$  in. long, pores angular, yellow; stem 2–3 in. long, tapering downwards, rooting, yellow, stained with red.

Differs from *B. chrysenteron* in incurved edge of cap and rooting stem.

On the ground under trees.

*B. cyanescens*.—Cap 2–5 in. across, often wavy, tomentose, tan-colour or brownish, flesh thick, white, deep blue when broken; tubes about  $\frac{1}{6}$  in. long, almost free from the stem, pores minute, pale lemon-yellow; stem 2–3 in. long, thickened below, coloured like the cap.

Sometimes straw-colour; known by the intense blue colour of the broken flesh.

In woods.

*B. parasiticus*.—Cap 1–2 in. across, almost plane, silky, yellowish tan; tubes about 2 lines long, pores yellow, then deep cinnamon; stem about 2 in. long, curved.

Variable in colour. Known by its remarkable habitat.

Parasitic on species of *Scleroderma*.

*B. duriusculus*.—Cap 2–3 in. across, hemispherical, minutely velvety, pale brown, chestnut or umber, often cracked; flesh whitish, changing to copper-colour when cut; tubes almost free from stem,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, pores yellow; stem 4–7 in. long, stout, yellowish, rough with dark projections.

Differs from *B. scaber* in yellow pores and flesh coppery when broken. Esculent.

In woods.

*B. pruinatus*.—Cap 2–3 in. across, purplish bay or reddish cinnamon with a brown bloom; white, then tinged blue or greenish; pores yellow, rounded, minute; stem about 2 in. long, swollen below.

Solitary or clustered. Marked by dark bloom on the cap.

Among grass under trees.

*B. variegatus*.—Cap 3–5 in. across, dingy yellow or pale tawny at the disc and paler towards the edge, with minute tawny squamules, flesh pale blue when cut; tubes about  $\frac{2}{3}$  in. long, pores small, yellowish, then brownish buff; stem 2–3 in. long, pale yellow.

Often gregarious. Flesh not always blue when cut. In fir woods, among heather, etc.

*B. æreus*.—Cap 3–4 in. across; convex, smooth, dark brown with a tinge of olive, or blackish brown, flesh white, yellowish when cut; tubes almost free from stem, pores sulphur-colour; stem 3–4 in. long, stout, yellowish or pale brown, surface somewhat netted.

Recognized by the dark cap and bright sulphur pores.

In woods.

*B. carnosus*.—Cap 4 in. across; smooth, bay-brown, flesh pale yellow; tubes shortened close to stem, pores angular, yellow; stem 2–3 in. long, yellow, more or less streaked with reddish brown, rather striate.

In woods.

\*\*\* *Cap viscid, at least when moist; ring absent.*

*B. badius*.—Cap 3–5 in. across, slightly convex, soon becoming dry and smooth, bay-brown, flesh slightly tinged blue when cut; tubes shorter round stem, but not free from it, pores irregular, yellow, then yellowish green, becoming dull green when bruised; stem 2–3 in. long, subequal, dingy ochre streaked with pale brown.

Known by the bay-brown cap and yellow-green pores which become dull green when bruised.

In woods, usually of conifers.

*B. piperatus*.—Cap 1–3 in. across, convexo-plane, soft, ochraceous tan, sometimes with a red tinge; tubes running down the stem, pores large, irregularly angular, pale olive, then cinnamon-brown; stem  $1\frac{1}{2}$ –2 in. long, smooth, darker than cap, base bright yellow, flesh yellow.

Distinguished by the peppery taste and yellow base of stem.

On the ground in woods.

*B. paludosus*.—Cap 3–4 in. across, thin, soon plane, smooth, even, bright rufous brown, flesh not more than 2 lines thick; tubes about 2 lines long, pores large, angular, yellow, then olive-green; stem 3–5 in. long, equal, paler than cap.

Gregarious. Distinguished by the thin flesh and long stem.

Among *Sphagnum* in a swamp.

*B. bovinus*.—Fasciculate in habit. Cap 2–3 in. across, soon almost flat, smooth, pale reddish yellow; tubes running down the stem, pores angular, often elongated, yellow, then brownish cinnamon; stem 2–4 in. long, rather slender, coloured like the cap.

Smell strong. Gregarious or tufted.

Fir woods among heather.



*B. granulatus*.—Cap 3–4 in. across, at first with reddish brown gluten, yellow when this has disappeared ; tubes about  $\frac{1}{4}$  in. long, pores more or less circular, yellow, with particles of a granulated substance adhering to the walls of the pores ; stem about 2 in. long, yellowish, with granulated points at the apex.

Distinguished by the yellow stem and pores being covered with a substance resembling granulated sugar. Edible.

Among grass under fir trees, etc.

*B. tenuipes*.—Cap 1–2 in. across, yellowish brown, viscid, streaked with minute fibrils when dry ; flesh rosy under the cuticle ; pores angular, yellowish ; stem about 3 in. long, solid, yellow.

Our smallest species of *Boletus*. Allied to *B. granulatus*.

In woods and open pastures.

*B. aurantioporus*.—Cap about 2 in. across, viscid, rusty, then yellowish brown, squamulose near the edge ; tubes running down the stem, pores large, angular, golden yellow, then orange, turning red when bruised ; stem about 3 in. long, streaked or netted with red and yellow.

Flesh becoming tinged red when broken. Recognized by the deep orange-yellow pores.

On the ground under trees.

\*\*\*\* *Stem with raised lines anastomosing to form a network.*

*B. pachypus*.—Cap 4–8 in. across, downy, brownish, then pale tan, flesh very thick, whitish, tinged blue when broken ; tubes about  $\frac{1}{3}$  in. long, short round stem, pores minute, rounded, yellow, tinged green ; stem subglobose, then lengthening out, 2–3 in. long, stout, regularly netted, variegated yellow and crimson or all crimson.

In woods.

*B. edulis*.—Cap 4–6 in. across, smooth, moist, brownish, paler towards the edge ; tubes up to  $\frac{2}{3}$  in. long, shorter round the stem ; pores angular, yellow, then greenish ; stem 2–3 in. long,  $1\frac{1}{2}$ –2 in. thick, buff, upper part with a polygonal network.

Cap resembling a penny bun in size and colour. Flesh unchangeable. Edible.

In woods.

var. *elephantinus*.—Flesh blue when broken.

var. *lævipes*.—Stem whitish, without a network.

*B. calopus*.—Cap 2–4 in. across, velvety, umber-brown with an olive tinge, flesh yellowish, blue when cut ; tubes about  $\frac{1}{4}$  in. long, pores minute, angular, yellow, then greenish ; stem 2–4 in. long, stout, usually more or less conical, reticulated, upper part crimson, lower portion yellow, sometimes entirely red.

Differs from *B. chrysenteron* and *B. subtomentosus* in the reticulated or netted stem, and from *B. olivaceus* in the edge of the cap not being incurved.

In woods.

*B. regius*.—Cap 3–5 in. across, convex, downy, bright rose-pink, pores golden yellow; stem 2–3 in. long, yellow except the base, which is dingy purple, network vague.

On the ground in open places.

*B. crassus*.—Cap 3–5 in. across, often wavy, densely tomentose, pale yellow-brown, flesh white, then pale primrose-yellow; tubes  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, shorter round the stem, pores whitish, then pale primrose-yellow; stem at first globose, then lengthened to about 2 in. and nearly as thick, paler than the cap, upper part with a conspicuous network.

Differs from *B. impolitus* in yellow flesh and reticulated stem. Differs from *B. pachypus* in the stem not becoming elongated, and absence of green in pores.

In woods and under trees in pastures.

*B. collinitus*.—Cap 3–4 in. across; smooth, even, at first covered with brown gluten, then pale; pores pallid, then yellow; stem 2–3 in. long, stout; narrowed downwards, whitish, then tinged brown, more or less covered with adpressed scales, giving it a netted appearance.

Much resembling *B. luteus*, but without a trace of a ring.

In fir woods.

2. *Surface of hymenium red, tubes more or less olive.*

*B. satanus*.—Cap 4–5 in. across, smooth, whitish or tinged buff; flesh very thick, whitish, first reddish, then bluish or violet when broken; tubes free from stem, rather short, yellowish, openings minute, blood-red, orange when old; stem 2–3 in. long, very stout, whitish or yellowish, with blood-red network upwards.

Cap rather variable in colour but always pale. One of the most beautiful of our fungi. Poisonous.

In woods.

*B. luridus* (Pl. XXVII, fig. 1).—Cap 3–6 in. across, downy, colour variable, usually dingy brown with an olive tinge; flesh yellow, changing at once to indigo-blue when cut; tubes shortened round stem, greenish olive, pores vermilion, orange or reddish brown; stem short, more or less swollen, variegated red and yellow with an indistinct network.

In woods and under trees in pastures.

*B. purpureus*.—This is the only remaining species having greenish tubes and red pores, and is readily distinguished by the deep purple-red cap and purple to orange-red pores.

3. *Tubes and pores both red.*

*B. rubinus*.—Cap 2–3 in. across, downy, pale yellow-brown; tubes and pores carmine; stem streaked red and yellow.

Our only *Boletus* with clear red tubes. Flesh yellow.

On the ground under trees.



4. *Tubes and pores dull pink or pale flesh-colour.*

*B. felleus*.—Cap 3–4 in. across, smooth, yellowish red, foxy or chestnut-colour, flesh white, dingy flesh-colour when broken; tubes about  $\frac{2}{3}$  in. long, shorter round the stem, pale flesh-colour; stem 2–3 in. long, dingy yellow with an irregular network. Taste bitter.

Distinguished by the pale pinkish tubes and spores, when dropped on white paper.

In woods.

5. *Tubes and pores both white or grey, sometimes becoming brownish.*

*B. laricinus*.—Cap 2–3 in. across, dirty white with livid or greenish stains, at first covered with dingy yellow or brownish slime; flesh white, unchangeable; tubes partly running down the stem, about  $\frac{1}{4}$  in. long, pores angular, white, then dingy olive-brown; stem 1–2 in. long, dirty white, netted above the ring.

On the ground under larches, etc.

*B. rubiginosus*.—Cap 2–5 in. broad, downy, soon smooth, reddish brown, flesh white, unchangeable; pores angular, permanently white; stem 2–3 in. long, whitish or tinged yellow, everywhere covered with a network.

On the ground in beech woods.

*B. viscidus*.—Cap 3–4 in. across, smooth, viscid, pale dingy yellow or buff, often with greenish stains; tubes about  $\frac{1}{2}$  in. long, pores large, unequal, often radially elongated, pale grey, then brownish; stem 2–3 in. long, pale yellow, vaguely netted upwards, flesh yellow at the base, ring more or less imperfect.

Differs from *B. laricinus*, to which it is closely allied, in the yellow tone of cap and stem, and in the radially elongated pores.

In woods.

*B. scaber* (Pl. XXVII, fig. 4).—Cap 3–6 in. across, very convex, smooth, even, often becoming wrinkled, colour variable, whitish or brownish; flesh white, unchangeable; tubes  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, shorter round the stem, white, then dingy brownish olive; stem 5–7 in. high, 1–1 $\frac{3}{4}$  in. thick at the base, conical, pale, rough with dark fibrous squamules that become larger towards base of stem.

Distinguished by the long, conical stem, rough with dark projections, unchangeable flesh and pores at first white, then dingy. Edible, flavour excellent.

In woods.

var. *fulvus*.—Cap ochraceous orange. Not good to eat.

var. *niveus*.—Every part white.

*B. versipellis*.—Cap 3–5 in. across, downy, then minutely squamulose, often becoming smooth, rufous orange, flesh thick, unchangeable; tubes about  $\frac{1}{3}$  in. long, free from stem, pores

minute, grey ; stem 4–5 in. long, pale, rugulose or squamulose, tapering upwards.

Differs from *B. scaber* in tomentose cap and grey pores.

In woods among heather, etc.

*B. alutarius*.—Closely allied to *B. felleus*, differing in the more or less bulbous stem, unchangeable flesh and mild taste.

In woodland pastures.

*B. porphyrosporus*.—Cap 4–6 in. across, minutely velvety, dark olive or brownish umber, becoming blackish when bruised, flesh blue near the tubes when cut ; tubes  $\frac{1}{2}$ – $\frac{2}{3}$  in. long, pores angular, grey, then pale brown, umber when bruised ; stem 4–5 in. long, stout, dingy greyish umber or brownish with an ochraceous tinge, minutely punctate.

Smell very strong. Spores purple in the mass, when thrown down on white paper, a character which marks this species.

Woods and among grass under trees, etc.

#### Sub-Genus GYRODON

Identical in structure and general appearance with *Boletus*, differing only in the very short tubes and wavy or sinuous pores of the hymenium.

*B. cæspitosus*.—Clustered, stems more or less grown together at the base. Cap 1–2 in. across, hemispherical, edge often wavy, olive-umber, becoming paler towards the edge, which is pink and downy ; flesh yellow, changing to an intense blue when broken ; tubes about  $\frac{1}{2}$  line long, pores very irregular, elongated and wavy, yellow ; stem  $1\frac{1}{2}$ –2 in. long, yellow, base often red.

Distinguished by the clustered habit, and by the very short, wavy pores.

Among grass, under trees.

*B. sistotrema*.—Cap smooth, rufous or yellowish brown ; tubes short, unequal, pores wavy, yellow ; stem pale rufous, or tinged pale brown.

Dry woods.

*B. McWeenyi*.—Cap convex, smooth, red, centre purplish, edge yellowish, about 1 in. across ; stem smooth, bright yellow ; pores wavy, yellow.

On the ground among moss.

#### STROBILOMYCES

Cap fleshy, becoming tough, covered with large overlapping scales ; tubes not easily separating from the flesh of the cap.

Resembling a *Boletus*, but with a scaly cap. The spores are also globose, whereas in *Boletus* they are elongated.

*S. strobilaceus*.—Cap fleshy, convex, 3–5 in. across, densely covered with large brown scales, edge of cap usually bearing frag-



ments of the white veil ; tubes long, white, pores large, irregularly angular ; stem 3–6 in. long, coarsely fibrillose, brown below, whitish and grooved above.

In fir woods, etc. Rare.

#### FISTULINA

Growing horizontally, fleshy ; hymenium on the under surface, at first minutely warted, the warts developing into tubes that remain distinct from each other.

Superficially resembling a large *Polyporus*, but distinguished by the tubes of the hymenium being free from each other, and closed at the mouth when young.

*F. hepatica* (Pl. XXIV, fig. 11).—Pileus thick and fleshy, soft, more or less tongue-shaped, often clustered, blood-red, flesh red and streaked ; tubes pallid, then red.

From 4–9 in. broad, form variable, resembling flaps of liver in colour and appearance, flesh resembling beef when cut. Known as the beef-steak fungus. Edible.

On old oak trunks and stumps. Rarely on other kinds of trees.

#### POLYPORUS

Pileus usually fleshy, soft, not velvety, grooved nor zoned, with a central stem or more or less horizontal and stemless or nearly so ; tubes not stratified.

Differs from *Polystictus* in thick flesh and smooth pileus, and from *Formes* in the tubes not being stratified. *Dædalea* differs in the corky, thick walls of the long, wavy pores. Large fungi growing on wood.

Some are destructive parasites.

1. Stem simple, central or excentric, or springing from the edge.

\* Stem not black at the base.

*P. leucomelas*.—Cap 2–5 in. across, edge often irregular, silky, blackish ; pores large, running down the stem, greyish ; stem 1–3 in. long, paler than the pileus.

On the ground in pine woods, etc.

*P. lentus*.—Cap 1–2 in. across, thin, tough, centre depressed, tan-colour ; pores shallow, large, angular, often elongated radially ; stem more or less central,  $\frac{1}{2}$ –1 in. long, slender, scurfy.

On wood, furze stems, etc.

*P. brumalis*.—Pileus 1–4 in. across, pliant, centre depressed, downy, umber, becoming smooth and paler the second year ; pores shallow, large, angular, elongated radially ; stem central, slender, velvety, 1–2 in. long.

On dead branches.

*P. fuscidulus*.—Pileus 1–2 in. across, thin, pliant, even, smooth,

yellowish brown ; pores yellowish, shallow, subangular ; stem 1-2 in. long, thin, smooth.

Differs from *P. brumalis* in the smooth stem.

On wood, chips, etc.

*P. leptcephalus*.—Pileus about 1 in. across, tough, convexo-plane, smooth, fawn-colour, edge often wavy ; pores roundish, minute, whitish, stem about 1 in. long, smooth.

On trunks.

*P. schweinitzii*.—Pileus 6-9 in. across, coarsely velvety, rusty brown ; flesh spongy, brown ; tubes about  $\frac{1}{4}$  in. long, pores large, irregular, yellow tinged green ; stem very short, thick, often obsolete.

In pine woods, about roots and stumps.

*P. rufescens*.—Pileus 3-4 in. across, soft and spongy, unequal, hairy, flesh-colour ; tubes rather short, pores wavy and torn, pale flesh-colour ; stem short, sub-central or near to one side.

Known amongst the hairy, soft-fleshed species by the pinkish hymenium and large irregular torn pores.

On stumps, etc.

\*\* *Stem black at the base.*

*P. squamosus* (Pl. XXVIII, fig. 1).—Pileus broadly fan-shaped or rounded, rather thin and flat, pallid or dingy pale yellow with large, adpressed, concentrically arranged brown scales, 6-12 in. across, flesh white ; pores very short, angular ; stem excentric or almost attached to edge of pileus, short, netted above, black at the base.

Often clustered. Large and fan-shaped.

On trunks and stumps.

*P. michelii*.—Pileus 2-4 in. across, thin, wavy, squamulose, white with a yellow tinge ; pores slightly elongated radially, white ; stem more or less on one side, white, dusky at the base.

On trunks and stumps, especially on willow.

*P. melanopus*.—Pileus 2-3 in. across, pliant, almost flat, then depressed in the centre, flocculose, then smooth, pale tan-colour ; pores decurrent, minute, white ; stem excentric, about  $1\frac{1}{2}$  in. long, often curved, minutely velvety, black.

Distinguished by the squamulose pileus when young, and the minute pores.

On roots, chips, and wood.

*P. rostkovii*.—Cap 4-6 in. across, pliant, smooth, even, smoky, infundibuliform, sometimes tinged tan ; pores decurrent, large, angular, dingy, then yellowish ; stem 3-6 in. long, excentric, abruptly black.

Several stems often grow together at the base. Differs from *P. squamosus* in absence of scales on cap.

On trunks and stumps of ash, etc.



PLATE XXVIII

1. POLYPORUS SQUAMOSUS
2. „ SULFUREUS





PLATE XXVIII.





*P. picipes*.—Pileus 2–4 in. across, centre or side more or less depressed, pliant, yellowish with the centre or altogether chestnut ; pores rounded, decurrent ; stem up to  $1\frac{1}{2}$  in. long, almost central or excentric, black up to the pores, velvety.

Differs from *P. varius* in the even pileus and velvety stem.

On trunks, especially willow.

*P. varius*.—Cap 2–5 in. across, depressed at point of origin of stem, pliant, often irregular, smooth, wrinkled, bay-brown or paler ; pores decurrent, rounded, pale, then cinnamon ; stem excentric or lateral, about 1 in. long, smooth, greyish black downwards.

Differs from *P. picipes* by the smooth stem and wrinkled cap.

On trunks and stumps, especially ash.

*P. elegans*.—Pileus 2–4 in. across, often angular, smooth, even, all of one colour, pale ochre to dull orange, shining ; tubes minute, more or less decurrent ; stem up to  $1\frac{1}{2}$  in. long, excentric or lateral, abruptly black below, rooting.

Distinguished by the almost flat pileus, even, and absence of bay or chestnut-colour.

On stumps and trunks, chiefly birch.

*P. petaloides*.—Pileus 2 in. or more across, very thin, wrinkled, smooth, pliant, dark chestnut ; pores decurrent, minute, white ; stem lateral, ascending, compressed, smooth, whitish, expanded at the base.

Distinguished by the lateral stem and dark chestnut pileus.

On old stumps.

2. *Pileoli numerous, springing from a stout trunk or tubercle, which often breaks up into branches.*

*P. umbellatus*.—Forming dense tufts 6–12 in. across. Very much branched, pileoli irregularly circular, depressed,  $\frac{1}{2}$ –2 in. across, smoky or dingy yellow, pores minute, white ; stems whitish, uniting to form a thick, root-like knob.

Numerous branches springing from a centre, and depressed pileoli, stamp the present species.

Near and on stumps in woods.

*P. frondosus*.—Tufts  $\frac{1}{2}$ –1 ft. across, much branched, pileoli very numerous,  $\frac{1}{2}$ –2 in. across, smoky grey, wrinkled, lobed and incurved ; stems white, growing into each other, pores very small, white.

Tufts up to 1 foot high, pilei very numerous, imbricated or variously grown together.

On stumps, roots and trunks.

*P. intybaceus*.—Tufts 1–2 ft. across ; very much branched, fleshy, rather brittle, pileoli numerous, yellowish or greyish brown, wavy, branches joined into a very short, stem-like base ; pores whitish brown. Smells like mice.

On trunks and stumps.



*P. cristatus*.—Forming large tufts. Stem white, stout, 1–2 in. long, irregularly branched, bearing a variable number of pileoli 2–3 in. across, rufous with a decided green tinge; pores whitish, angular, irregular.

Known amongst the branched, brittle species by the greenish colour of the pileus. Pores more or less tinged green when broken.

On trunks, stumps, etc.

*P. giganteus*.—Consisting of many overlapping large flaps or pileoli which are very broad, limp, slightly zoned and streaked, depressed behind, pale, then brownish yellow, surface granulated with minute dark squamules; stem much branched, springing from a tuberos base; pores minute, pallid, roundish, becoming darker at once when bruised.

Recognized by the large, overlapping yellowish brown flaps, and the pale pores becoming dark when bruised. Our commonest species of this group.

At the base of trunks, forming tufts 1–2 ft. across.

*P. acanthoides*.—Overlapping; pliant when growing, then firmer, pileoli infundibuliform, edge lobed, 2–5 in. across, rusty or pale chestnut, wrinkled, smooth; stem variously branched, narrowed downwards, pale, then reddish; pores more or less decurrent, whitish, then tinged rufous.

Distinguished by the much-depressed pileoli.

On trunks, stumps, buried wood, etc.

*P. sulfureus* (Pl. XXVIII, fig. 2).—Horizontal and attached by a broad base, usually many overlapping pileoli, pale flesh-colour with a yellow tinge, or yellow; pores up to  $\frac{1}{2}$  in. long, plane, sulphur-yellow. Smell very strong and unpleasant.

Pileoli often wavy, known by the bright sulphur-coloured pores and very unpleasant smell.

On trunks.

*P. herbergii*.—Tufted, 4–8 in. across, soft and corky, pileoli overlapping, bright rusty-bay, becoming sulphur-yellow towards the edge; pores wavy, pale grey.

Minutely velvety, soft to the touch.

On trunks.

*P. alligatus*.—Usually composed of tufted, overlapping pileoli, 1–3 in. across, fragile, dingy tan-colour, minutely velvety; pores soft, white.

Variable. No distinct stem present, pileoli often circular in outline, wavy.

On roots. Often involving twigs, grass, etc.

*P. heteroclitus*.—Tufted, leathery, pileoli springing from every side of a hard tubercle, lobed, downy, yellowish, then brownish orange, 1–2 $\frac{1}{2}$  in. across; tubes elongated, irregular, yellow, then brownish.

On the ground, growing from stumps, roots, etc.

*P. salignus*.—Tufted, soft, elastic, pileoli flattened, overlapping, more or less kidney-shaped, whitish, grooved near the thick, wavy edge ; pores wavy, elongated, white.

On decaying willows.

*P. spongia*.—Tufted, much divided, pileoli 3–6 in. across, spongy, soft, numerous, attached by the side, wrinkled, velvety, rusty brown ; pores sulphur-coloured, then brownish.

Differs from *P. schweinitzii* in the densely tufted habit, brighter colour and small, entire pores.

On dead trunks of pine, etc.

3. *Pileus sessile, bracket-like and attached by a broad base, or partly resupinate with a free projecting part.*

\* *Pileus rusty, brownish or dusky.*

*P. dryadeus*.—Pileus 6 in. to 1 foot across, bracket-shaped, fleshy, then corky, smooth, rugged, rusty, then brown, often exuding drops of water towards the edge, flesh rusty ; tubes  $\frac{3}{4}$ –1½ in. long, rusty, pores rounded, paler.

Smell strong, somewhat acid. Sometimes imbricated.

Near the base of oak trunks.

*P. hispidus* (Pl. XXIX, fig. 1).—Bracket-shaped, sometimes imbricated, 5–9 in. across, fleshy, coarsely hispid, rusty brown ; flesh thick, spongy, fibrous, rusty ; tubes  $\frac{1}{2}$ –1 in. long, yellowish, then brownish, often exuding drops of water.

On trunks of ash, apple, plum, etc. A very destructive parasite.

*P. cuticularis*.—Horizontal, semicircular, point of attachment somewhat narrow, coarsely hairy, rusty brown, flesh rather thin, yellow-brown, edge fibrous, incurved ; tubes longer than the thickness of the flesh, pale, then rusty, pores minute.

Often imbricated, the pilei growing into each other. Differs from *P. hispidus* in the thinner flesh and larger pores.

On trunks.

*P. quercinus*.—Pileus tongue-shaped, horizontal, narrowed behind into a thick stem 3–6 in. long, granular, pale tan or tinged red, and reddish when bruised, flesh coloured, corky ; tubes about 2 lines long, pores rounded, whitish.

Somewhat resembling *Fistulina hepatica* in general appearance.

On dead oak trunks.

*P. keithii*.—Shell-shaped, effuso-reflexed, narrowed behind, about  $\frac{1}{2}$  in. across, reddish brown, rough with spine-like points ; pores large, angular, pallid.

On fallen branches.

*P. crispus*.—Horizontal, effused behind, thin, pliant, wrinkled, smoky black, then greyish, edge remaining blackish, 1–2 in. across ; pores large, unequal, at length torn, silvery grey.



PLATE XXIX

1. POLYPORUS HISPIDUS
2. FOMES FOMENTARIUS



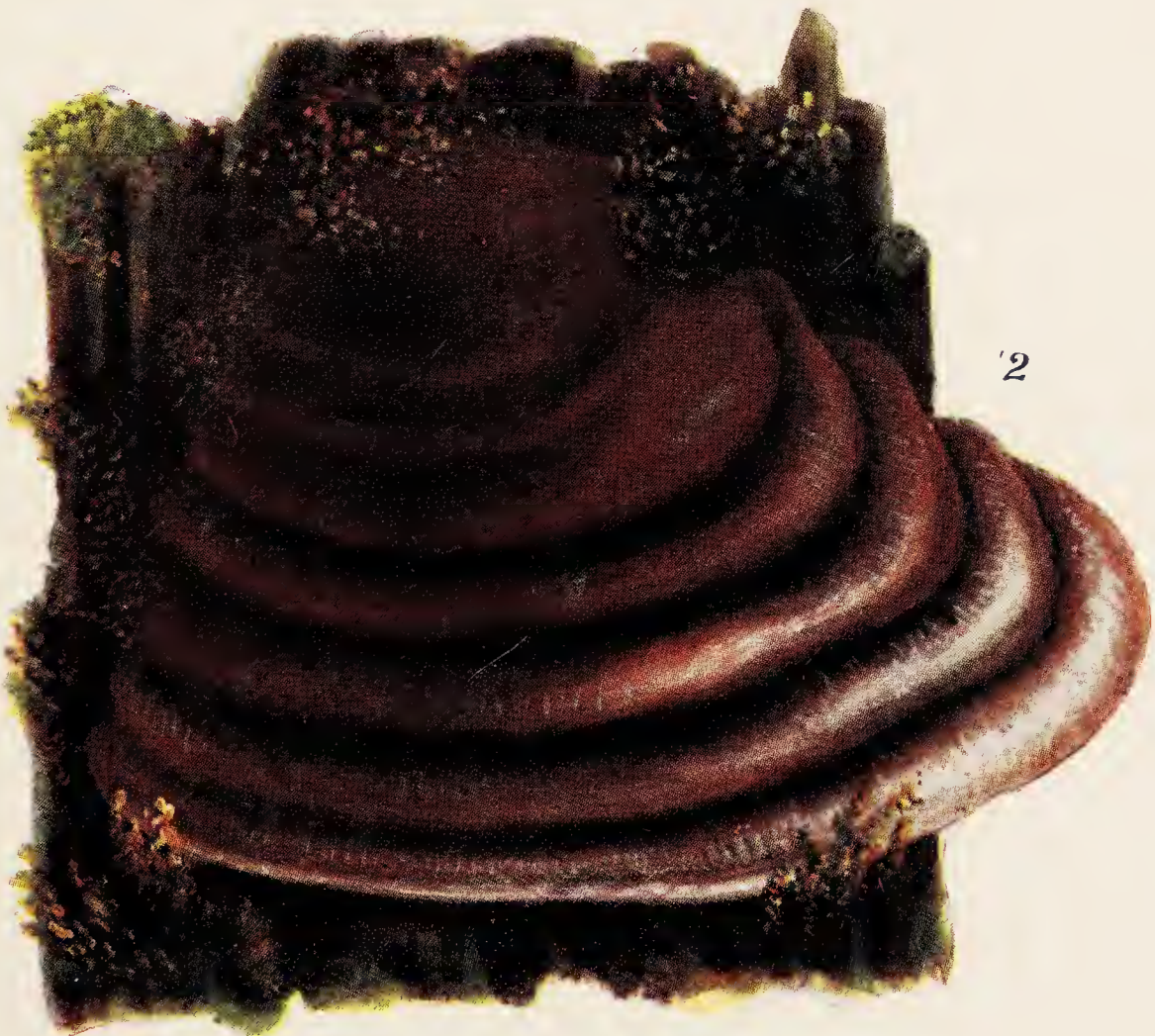


PLATE XXIX.





Distinguished at once from allies by the coarsely fibrous, wrinkled pileus and large pores. Pores much larger than in *P. adustus*.

On old stumps, etc.

*P. nidulans*.—Pileus fleshy, soft, convex above and below, downy, then smooth, yellowish red, as is also the flesh; tubes elongated, pores large, angular, tawny.

Fragrant when dry. Remarkably soft.

On trunks and fallen branches.

*P. mollis*.—Pileus 1-5 in. long, effuso-reflexed, soft, wrinkled, edge sharp, brownish flesh-colour; flesh white; pores soft, elongated and wavy, white, reddish when touched.

Several specimens often grow into each other; sometimes resupinate. Known by the white pores becoming foxy when touched.

On dead pine wood.

*P. rutilans*.—Pileus tough, thin, soft, at first downy, tawny cinnamon, then paler, flesh similar in colour; pores minute, cinnamon.

Smell strong, like aniseed when fresh. Pores shining white when young, changing to cinnamon.

On fallen branches.

*P. destructor*.—Pileus 2-6 in. long, effuso-reflexed, fragile, wrinkled, rather wavy, brownish white, flesh watery, zoned; pores white, rounded, becoming torn into teeth.

Pores forming almost the whole of the fungus, sometimes almost resupinate.

On wood, especially that has been worked.

\*\* *Pileus white, pale ochraceous, etc., always pale.*

*P. betulinus*.—Pileus hoof-shaped, thick, soft, elastic, umbonate behind at point of attachment, 3-6 in. across, edge thick, incurved, whitish, zoneless, smooth; flesh thick, white; pores minute, whitish.

Distinguished by the thick, smooth, whitish pileus with a thick, incurved edge.

On birch trunks.

*P. borealis*.—Pileus horizontal, attached by a broad base or narrowed to a stem, hairy, corky, whitish, then dingy yellow, flesh thick, fibrous, whitish; pores unequal, wavy, becoming torn, white.

A slight smell of aniseed when dry, fleshy, then corky.

On stumps and trunks of pine.

*P. fumosus*.—Horizontal, often imbricated, effused behind, silky, then smooth, pallid with a smoky tinge, zoneless, flesh up to  $\frac{1}{4}$  in. thick; pores shallow, roundish, small, whitish with smoky tinge, darker when bruised.

On old trunks, stumps, etc.



*P. adustus*.—Effuso-reflexed, imbricate, or entirely resupinate, thin, limp, downy, pale grey, obsoletely zoned, wrinkled; pores shallow, minute, round, soon dingy grey, blackish when dry.

Differs from *P. fumosus* in thinner substance, and in the pores becoming blackish in drying.

On trunks, stumps, etc.

*P. amorphus*.—Effuso-reflexed or resupinate, thin, pliant, incurved and rigid when dry, whitish, minutely velvety; pores small, golden yellow.

On rotten pine wood, or running over pine leaves.

*P. epileucus*.—Pileus horizontal, 3–5 in. across, 1–2½ in. thick, soft, then firm, whitish, rugged with downy projections, flesh whitish; tubes 2–3 lines long, pores minute, round, ochraceous tan.

Simple, large, suborbicular, concave below.

On trunks and stumps.

*P. alutaceus*.—Pileus 1–2 in. across, reniform, fleshy, minutely velvety, pale dingy ochraceous, flesh similar in colour; tubes rather long, pores minute, pale ochre.

Soft, fragile, several pilei often growing together.

On trunks and stumps.

*P. chioneus*.—Pileus 1–2 in. across, thick and fleshy, soft, smooth, zoneless, often imbricated, white; pores minute, round, equal, white.

Watery white when moist. Distinguished amongst the soft, entirely white species by the absence of bluish or rusty stains when bruised.

On trunks and stumps of conifers, etc.

*P. cerebrinus*.—Resupinate, thickish, about 1 in. across, snow-white, tomentose, edge notched; pores large, rounded, with thick, entire walls.

Looks like a portion of a white brain.

On fir.

*P. cæsius*.—Resupinate or horizontal, 1–3 in. across, soft, silky, white, here and there tinged with blue; pores minute, wavy, becoming torn into irregular teeth.

Altogether white, becoming bluish when touched.

On dead trunks, especially pine.

*P. spumeus*.—Whitish, 3–4 in. across, fleshy, spongy, rugged and hispid, edge incurved, base stem-like; pores minute, rounded, edges entire.

Oozing out in a soft mass which hardens in a day, and under favourable conditions becomes hairy.

On living or dead trunks of beech, birch, etc.

*P. lacteus*.—White, 1–2 in. across, triangular, fibrous, fleshy, fragile, downy, the incurved edge sharp; pores medium-sized, wavy and soon torn.

Distinguished by the walls of the wavy pores becoming torn into shreds or teeth as in *Sistotrema*.

On dead laburnum, birch, beech, etc.

*P. pallescens*.—Pileus fleshy, then corky, 2–4 in. across, even, smooth, zoneless, margin sharp, yellowish; tubes short, pores minute, rounded, white, then yellowish.

Somewhat clustered, small and thin.

On stumps, trunks, branches, etc.

*P. trabeus*.—White, pileus fleshy, effuso-reflexed, elongated, pallid; pores minute, edges toothed, white.

On pine wood.

*P. fragilis*.—Whitish, becoming spotted with brown when bruised, fleshy, reniform, wrinkled, convex below; pores slender, tubes elongated, pores wavy, white.

Distinguished among the soft white species by becoming brown when bruised.

On decayed fir wood and stumps.

*P. fibula*.—Whitish; pileus leathery, soft, velvety-hairy, zoneless, often radiately wrinkled, edge entire, sharp, flesh snow-white; pores small, roundish, walls becoming torn, at length tinged yellow.

Variable in form, sometimes forming rounded patches.

On fallen oak branches, worked wood, etc.

*P. adiposus*.—Effuso-reflexed or resupinate, soft, pileus white, here and there tinged brown, minutely downy; pores small, angular, white with tinges of brown.

Often irregularly effused for several inches, with here and there short free portions of pileus.

On stumps, and on the ground near roots, wood, etc.

*P. armeniacus*.—Forming resupinate patches of variable size, thin, edge downy; pores shallow, rounded, rather irregular, pure white, changing to a deep buff-colour on drying.

Resembling a *Poria* in general appearance, but the substance is soft.

On dead wood and branches.

## FOMES

Pileus hard and woody from the first, covered by a hard crustaceous cuticle, without colour zones, but often with concentric ridges, tubes elongated, stratified, one stratum (the lowest or outermost one) formed each year; perennial.

Most of the large bracket-shaped, hard, woody fungi growing on the trunks of trees belong to this genus, which is recognized at once among the fungi having a porous hymenium by the tubes being in distinct strata, indicated by lines, when a section of the fungus is examined.



## PLATE XXX

1. EXIDIA ALBIDA
2. TREMELLA MESENERICA
3. SCHIZOPHYLLUM COMMUNE
4. UNDER SURFACE OF FIG. 3
5. LENZITES FLACCIDA
6. UNDER SURFACE OF FIG. 5
7. TROGIA CRISPA
8. DACRYOMYCES STILLATUS
9. EXIDIA GLANDULOSA

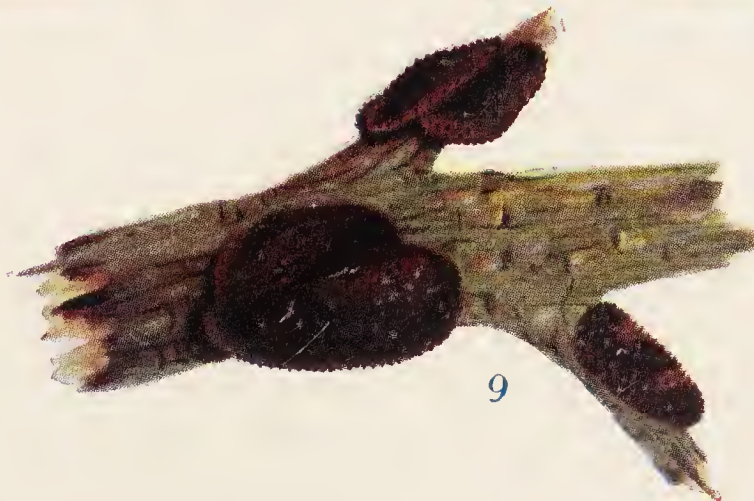
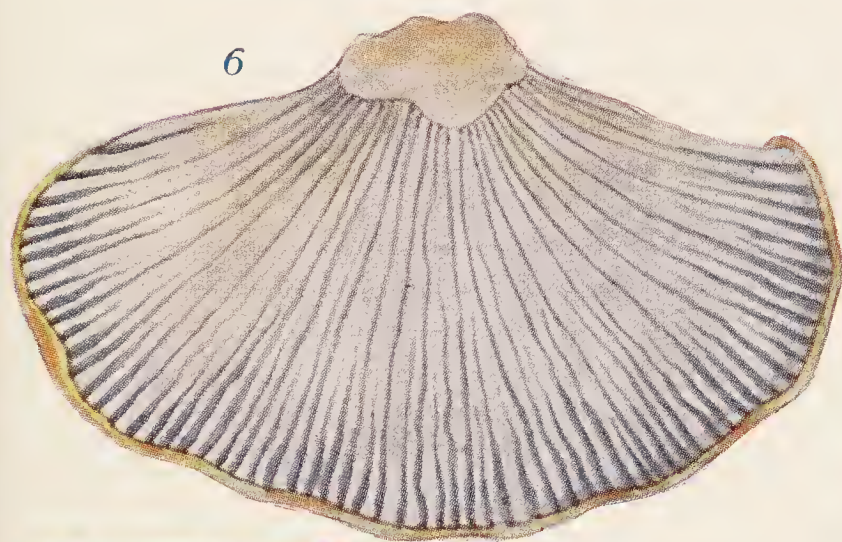
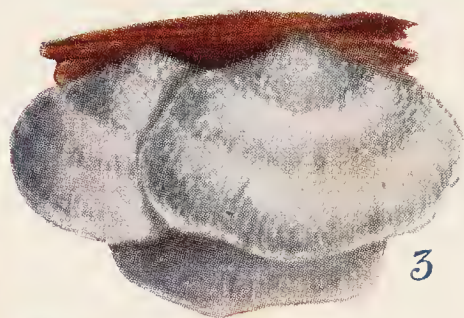


PLATE XXX.





separate it from *F. applanatus*. One of our largest species, often a foot across.

On trunks of lime, elm, etc.

*F. fulvus*.—Triangular in section, very hard, convex above and below, pileus even, downy, tawny and greyish, flesh rusty ; pores cinnamon.

On decaying trunks, especially poplar.

*F. annosus*.—Irregular in form, coarsely radiately wrinkled, smooth, chestnut, edge white, pores whitish.

About roots and stumps of conifers. Parasitic.

*F. applanatus*.—Horizontal, semicircular, rather thin, cap flattened, nodulose, polished, brown, 5–10 in. across ; pores whitish, hymenium flat.

Distinguished by the brown pileus and the flat white hymenium.

On trunks.

*F. conchatus*.—Thin, rigid, effuso-reflexed, the reflexed portion curved ; tubes very short, pores minute, every part rusty brown.

On trunks of willow, etc.

*F. variegatus*.—Pileus 3–5 in. across, flattened, thin, corky, even, smooth, zoneless, shining, orange variegated with chestnut ; pores yellowish.

On trunks.

*F. ribis*.—Horizontal, imbricated, rigid, flattened, velvety, rusty ; pores minute, rusty.

On old currant and gooseberry bushes, often imbricated and running down the trunk.

*F. carneus*.—Effuso-reflexed or horizontal, 2–6 in. long, woody, thin, smooth, zoneless, radiately wrinkled, dingy flesh-colour ; pores decurrent.

On trunks, stumps, etc.

*F. resupinatus*.—Resupinate, forming a crust often broadly effused, with here and there nodulose outgrowths or pilei, very thin, pores nearly circular, entirely rusty. Tubes stratified.

On trunks and branches.

*F. ferruginosus*.—Broadly effused, resupinate,  $\frac{1}{2}$ –1 in. thick, with here and there free projecting pilei ; tubes elongated. Altogether rusty, then brownish.

Forming broadly effused crusts on trunks, posts, etc.

### POLYSTICTUS

Pileus coriaceous, thin, velvety or fibrillose ; tubes quite shallow, not stratified.

Distinguished from *Polyporus* by the thin substance, velvety or fibrillose pileus and very shallow pores. *Fomes* differs in the thick, woody structure and stratified tubes.



1. *Fungus with a central stem.*

*P. perennis*.—Pileus 1–3 in. across, thin and pliant, flattish, but depressed at the centre, velvety, indistinctly zoned, cinnamon-colour, then yellowish red; pores very short, minute, angular; stem 1–1½ in. long, slender, minutely velvety, colour of cap.

Stem central; cap sometimes only slightly depressed at the centre, sometimes almost funnel-shaped.

On the ground under trees, also on fallen trunks.

*P. cinnamomeus*.—Closely resembling *P. perennis* in general appearance and size, differing more especially in the larger angular pores.

On the ground under trees.

2. *Pileus sessile, dimidiate or attached by a broad base, often with an adnate portion.*

\* *Pileus dark-coloured.*

*P. versicolor* (Pl. XXXI, fig. 4).—Pileus horizontal, thin, rigid, more or less semicircular and narrowed at the point of attachment, densely velvety, shining, zoned with various colours; pores very short, minute, whitish.

One of our commonest, most beautiful, and most variable of fungi. Sometimes almost entirely resupinate with only the upper portion free, most frequently as described above. Often tufted or imbricated. Pileus often dusky green with brown or orange zones.

On trunks, stumps and branches.

*P. radiatus*.—Pileus corky, rigid, radiately wrinkled, velvety and foxy, then smooth and rusty, about 1 in. across; pores minute, pallid with a silvery sheen, then rusty.

Differs from *P. versicolor* in the thicker substance and radiately wrinkled pileus.

On alder, hazel, etc.

*P. polymorphus*.—Pileus 1 in. or more across, resupinate, upper edge loose and reflexed, crisped, smooth, umber; pores rather large, angular, pallid, torn.

On branches, worked wood, etc.

\*\* *Pileus whitish, yellowish or pale tan-colour.*

*P. hirsutus*.—Pileus rather corky, 1–3 in. across, horizontal, almost flat, densely hairy, whitish all over, concentrically zoned; pores roundish, white, then dingy.

Variable, sometimes almost entirely resupinate; at others quite free and attached by a broad base. Often imbricated.

On trunks, stumps, posts, etc.

*P. albidus*.—White. Pileus between corky and woody, variable in shape, free from the matrix, not zoned, but roughly wrinkled, edge blunt; pores minute, subangular, acute, dissepiments or walls entire at the opening.

Variable in shape, truly dry in texture, elastic, becoming hard and woody, globose, shell-shaped, triangular or substipitate, but not effuso-reflexed.

On decaying pine wood.

*P. velutinus*.—Pileus horizontal, thin, corky, then rigid, velvety, white, then yellowish, indistinctly zoned ; pores shallow, irregularly angular, white.

Sometimes imbricated, 1–3 in. across ; differs from *P. versicolor* in whitish colour, and from *P. hirsutus* in soft, velvety pileus. When young often clear yellow.

On trunks and stumps.

*P. gossypinus*.—White. Pileus 1–4 in. across, adnato-reflexed, flat, thin, downy, zoneless ; pores rather deep, wavy, then angular, greyish.

Distinguished by the irregular, torn, greyish pores.

On trunks, furze stems, etc.

*P. abietinus*.—Pileus thin, limp, partly adnate and partly loose and reflexed, silky, greyish white, indistinctly zoned ; pores violet, unequal, torn, becoming pale.

Often crowded and imbricated for several feet.

On trunks of decaying fir trees.

*P. wynnei*.—Pileus leathery, partly effused and partly loose and reflexed, or encrusting various substances, tan-coloured, with raised zones ; pores shallow, minute, angular, white.

Running over twigs, moss, etc.

## PORIA

Entirely resupinate, forming extended patches, thin ; pores usually covering the entire surface, minute, more or less circular, often becoming torn and irregular.

Distinguished from resupinate forms of allied genera by the small, regular pores.

1. *Pores persistently whitish.*

*P. vaporaria* (Pl. XXXI, fig. 3).—Broadly effused, thin, inseparable ; pores rather large, angular, often becoming torn, white, then yellowish.

Probably the commonest and most universally distributed of fungi, present practically on every fallen, rotten branch in woods, which it often almost completely covers. Pores becoming unequal and torn, pale tan when old. More frequent on bark than on naked wood.

*P. mollusca*.—Effused and forming patches 1–6 in. across, soft, white, edge fibrillose and radiating ; pores very short, minute, roundish, occupying the central portion, or in scattered clusters.



PLATE XXXI

1. TRAMETES SUAVEOLENS
2. SECTION THROUGH FIG. 1
3. PORIA VAPORARIA
4. POLYSTICTUS VERSICOLOR
5. DÆDALEA QUERCINA



PLATE XXXI.





Known by the fibrillose, radiating edge ; walls of pores very thin and often torn.

On dead wood, heaps of leaves, etc.

*P. vulgaris*.—Forming patches 6–12 in. across, flesh almost obsolete, consisting almost entirely of minute roundish pores  $\frac{1}{2}$ –1 line deep.

On dead wood and branches.

*P. medulla-panis*.—Forming patches 2–4 in. across and about 2 lines thick, edge naked, determinate, flesh obsolete, consisting almost entirely of medium-sized, roundish pores.

Rigid and separable when dry.

On rotten wood and branches.

*P. vitrea*.—Forming irregular patches up to 2 in. across, whitish, subhyaline, separable, indeterminate, edge downy, flesh below the pores distinct ; pores minute, entire, about  $1\frac{1}{2}$  lines long, straight or oblique.

Readily separable from the wood.

On rotten wood, especially fir.

*P. hibernica*.—Appearing as small circular spots which soon grow into each other, forming very irregular patches, white, inseparable, edge downy, radiating ; pores small, polygonal, short.

On pine wood.

*P. gordonensis*.—Forming patches 1–2 in. across, thin, separable, persistently white, edge fibrillose ; pores minute, unequal, angular, toothed at the edge.

Differs from *P. hibernica* in being separable, and from *P. radula* and *P. vaporaria* in the smaller and more regularly angular pores.

On fir poles.

*P. blepharistoma*.—Thin, snow-white, patches 1–2 in. across ; pores very shallow, small, edges toothed.

On dead wood, branches, etc.

*P. farinella*.—Forming irregular, thin, pulverulent patches about 1 in. across ; pores unequal, wavy.

Very thin and almost disappearing when touched.

On dead beech wood, etc.

*P. reticulata*.—Forming roundish, thin white patches that soon disappear ; pores resembling a very shallow network, rather large.

On rotten wood.

*P. vaillantii*.—Patches very thin and fibrous, with thread-like, spreading mycelium ; pores rather large, occurring in scattered clusters.

Known by the spreading white, thread-like mycelium connecting the patches of membrane producing the pores. Becoming tinged brown.

On dead wood.



*P. callosa*.—Patches broadly effused, tough, separable as a sheet, flesh 1–2 lines thick ; pores round, equal, edge entire.

Readily known by the leathery flesh readily separating from the wood.

*P. mucida*.—White, rather thick, soft, edge indeterminate, downy ; pores medium-sized, unequal, torn.

Forming patches up to 6 in. across, and up to  $\frac{1}{2}$  in. thick. Tubes about 1 line long.

On rotten fir wood.

*P. hybrida*.—Forming thickish, felt-like patches or branched, creeping strands ; pores minute, about  $1\frac{1}{2}$ –2 lines long, occurring in scattered patches.

Causing the dry-rot of oak ships.

On oak wood.

*P. collabefacta*.—Forming white, very smooth, *Corticium*-like patches ; pores appearing as if due to the contraction of the hymenium into very shallow depressions.

On dead wood.

*P. radula*.—Patches formed entirely of loosely interwoven mycelium, supporting medium-sized, shallow, angular pores with toothed edges.

With the habit of *P. sanguinolenta*, but much looser and dryer in texture, also separable from the matrix, and not turning red when bruised ; pores sometimes oblique, usually bounded by a sterile margin.

On wood, dry branches, etc.

*P. obducens*.—White, effused, encrusting, innate, inseparable from the matrix ; pores minute, short, flesh almost obsolete, distinctly stratose, stratified portion pale buff.

During the first year somewhat resembling *P. vulgaris*, afterwards becoming stratose, a single stratum of pores about 1 line thick being formed annually on the surface of the layer of the previous season. Sometimes small pileoli are formed. It has been definitely proved that this is only a resupinate condition of *Polyporus connatus*, yet it is given here also, as under certain forms it appears to be such a typical *Poria*, that it might not be connected with *P. connatus*.

*P. hymenocystis*.—Snow-white, edge of patches cobweb-like ; pores shallow, large, at length collapsing and tinged buff.

Exceedingly thin, walls of pores soon collapsing.

On dead wood.

\*\* *White, changing colour when dry.*

*P. subfusco-flavida*.—Patches 6–10 in. across, thin, dry, changing from white to yellowish brown, edge determinate, downy, white ; pores minute, irregular.

The pores appear to be greyish brown when seen one way, and white when seen the opposite way.

On dead oak wood, planks, etc.

*P. viridans*.—Patches 2-4 in. long, thin, white, then pallid green ; pores minute, angular.

On rotten wood.

*P. renneyi*.—Rather thick, frothy, then dry, white, changing to citron-yellow ; pores white, few, somewhat elongated.

On stumps and running over the ground.

*P. terrestris*.—Effused, very thin, consisting of fine hyphæ, evanescent, white, then brownish ; pores central on the mass, very minute, angular.

Very thin, almost disappearing when touched.

On the ground or on rotten wood, in damp places.

*P. cincta*.—Forming small scattered tufts, each surrounded by fibrillose strands, white, then pallid ; pores minute, angular, walls very thin, edge toothed, buff, darker when dry.

Tubes up to 2 lines long. Brown and rigid when dry.

On old deal boards.

*P. subgelatinosa*.—Patches more or less circular, subgelatinous, edge raised, whitish and downy, becoming blackish ; pores grey, angular, very shallow.

On dead wood, also on species of *Polyporus*.

*P. sanguinolenta*.—Commencing as scattered nodules which soon coalesce and form an extended patch, white, becoming blood-red when touched ; pores roundish, small.

Easily recognized by its remarkable change of colour when bruised.

On branches, rails, boards, etc.

\*\*\* *White with a pink or red tinge.*

*P. rhodella*.—Soft, thin, edge naked, determinate, white with a pink or rosy tinge ; pores minute, short, roundish.

On trunks of beech, fir, etc.

*P. micans*.—Forming roundish patches, several often running into each other, soft, white with a flesh tinge ; pores shallow, angular, resembling honeycomb, edge minutely toothed.

On dead wood, rotten trunks, etc.

\*\*\*\* *Pores yellow, ochraceous or honey-colour.*

*P. læstadii*.—Thin, nodulose here and there, separable ; pores circular or rather wavy, minute, bright citron-yellow.

On old boards.

*P. nitida*.—Patches with a determinate, downy margin ; pores short, minute, round, bright yellow or almost golden, shining.

On rotten wood.



*P. bombycina*.—Silky, thin, loosely attached to the matrix, edge velvety, dirty yellow ; pores large, angular and wavy.

On rotten wood.

*P. ramentacea*.—Patches roundish, edge obsolete ; pores honey-colour, large, angular, edges entire.

Cartilaginous when dry.

On dead branches.

\*\*\*\*\* Pores umber, rufous, brown, purple, flesh-colour or cinnamon.

*P. umbrina*.—Patches 2–3 in. across and up to  $\frac{1}{2}$  in. thick, rather uneven, dingy umber ; pores minute, roundish.

Distinguished by the umber colour and the pale, smooth edge.

*P. rufo*.—Thin, leathery, determinate, blood-red with a rufous tinge ; pores minute.

On branches and fallen trunks.

*P. aneirina*.—Patches thin, tawny, edge white ; pores large, waxy, angular.

Distinguished by the large pores, which have a peculiar waxy aspect, becoming contracted and torn when dry.

On dead wood and branches, especially poplar.

*P. incarnata*.—Forming patches 3–6 in. across, corky, persistent, edge often reflexed, flesh-colour ; pores elongated, irregular, often oblique.

Care must be taken not to confound this species with *Polystictus abietinus*, which differs in the large, torn pores, violet, then pale.

On rotten trunks of conifers.

*P. violacea*.—Patches thin, violet-colour ; pores very shallow.

To be carefully distinguished from *P. incarnata*, which is much thicker ; also from *Polystictus abietinus*.

On fir stumps, trunks, and poles.

*P. purpurea*.—Broadly and irregularly effused with mycelium, producing here and there clusters of minute purple pores.

On rotten trunks of beech, willow, etc.

*P. contigua*.—Effused, about  $\frac{1}{2}$  in. thick, cinnamon when young, dingy when old ; pores rather large, equal, entire.

On rotten wood and fallen branches.

#### TRAMETES

Horizontal and attached by a broad base, more or less semi-circular in form, corky or woody ; pores roundish or somewhat elongated radially with thickish plates ; pores penetrating to different depths into flesh of cap.

Intermediate between *Dædalea* and *Polyporus*, differing from the former in not having long, wavy pores and thick, gill-like plates ; and from the latter in not having the pores of uniform depth and size.

*T. pini*.—More or less semicircular, concentrically grooved, rough, rusty brown, 3–4 in. across, flesh rusty, hard ; tubes long ; pores irregular, small, rusty.

On living pine trunks. A destructive parasite.

*T. gibbosa*.—About semicircular, horizontal, concentrically zoned, velvety, whitish, corky, 2–4 in. across ; tubes about  $\frac{1}{4}$  in. deep ; pores small, elongated radially.

Often with a green tinge due to the presence of minute algæ.

On stumps, trunks, posts, etc.

*T. bulliardi*.—Semicircular, thick at point of attachment, free edge thin, white, then brownish and zoned ; tubes about  $\frac{1}{4}$  in. deep ; pores roundish.

Smell fragrant. Flesh wood-colour.

On dead wood.

*T. suaveolens* (Pl. XXXI, fig. 1).—Semicircular, thick behind, edge thin, downy, whitish, 3–6 in. across, flesh white, corky ; tubes  $\frac{1}{2}$  in. or more in length ; pores rounded, large, white, then brownish.

Smell spicy.

On trunks, especially willow. Smell like aniseed.

*T. odorata*.—Dimidiate, at first somewhat corky, rather soft and downy externally, and the flesh fulvous, becoming vaguely concentrically zoned, rugulose, tomentose and blackish umber, 3–5 in. long, 2–3 in. broad, edge and the rather large, subrotund pores tawny cinnamon. Odour rather strong, spicy.

Distinguished by the blackish umber, coarsely rugulose cap, spicy smell, and the fairly large pores. The general surface of the hymenium is generally very uneven, certain groups of tubes projecting beyond the general surface here and there. The hymenium is usually more or less decurrent, sometimes running down the substratum for 2–3 inches. The cap is generally dimidiate, and attached by a broad base ; sometimes, however, the point of attachment is narrowed behind. Known from our other scented species by the blackish brown cap and coloured flesh.

British specimens of this species have been erroneously referred to *Polyporus benzinus*.

On decaying coniferous wood in the New Forest. Apparently very rare.

*T. odora*.—Semicircular, thick behind, narrowing to a thin edge, whitish, even, downy, 2–4 in. across, flesh corky, whitish ; tubes up to  $\frac{1}{4}$  in. deep ; pores round, small. Smell spicy.

Differs from *T. suaveolens* in the smaller, shorter, round pores.

On willow.

*T. inodora*.—Semicircular, whitish, tapering to a thin edge ; pores subangular or often elongated. Inodorous.

Distinguished among the white species by the absence of smell.

On stumps, trunks, etc.



*T. serpens*.—Resupinate, white, inseparable, bursting through bark, orbicular, several joining and forming long patches ; pores very shallow, rounded or angular, unequal.

On bark.

*T. mollis*.—Resupinate, often broadly effused, thin, separable, edge sometimes reflexed ; pores large, unequal, often torn, pale wood-colour.

On wood and branches, especially beech.

*T. terrei*.—Resupinate, pulvinate, about 3 in. across, 1 in. thick in the centre, thinning away on every side to the edge, substance white, corky, firm ; pores angular, rather large, here and there sinuous, pallid.

A doubtful species, perhaps.

On beech trunks.

#### DÆDALEA

Substance dry and corky ; hymenium formed of thick, tough plates which are a compromise between gills and pores, being sometimes formed of flat plates, which become variously joined and form irregular pores.

All the species are dry and woody or corky, and the hymenium consists of very irregular, wavy pores, mixed sometimes with gill-like plates.

*D. quercina* (Pl. XXXI, fig. 5).—Pale wood-colour, corky. Cap irregularly rugulose, irregularly rounded, sessile ; hymenium inferior, consisting of thick, springy plates, in some parts resembling gills, in other parts joined by cross-pieces to form long, wavy pores, 4–8 in. across.

On dead oak stumps and trunks.

*D. aurea*.—Cap rather thin, coarsely velvety, golden or tawny, slightly zoned ; pores narrow and very wavy, yellow, 1–2 in. across.

On oak. Often more or less triangular in form.

*D. confragosa*.—Corky. Attached laterally, thick at point of attachment, edge thinner, rough, reddish brown ; pores rounded, then narrow and wavy, grey, 2–5 in. across.

On willow, etc.

*D. cinerea*.—Corky. Attached by a broad, thick base, margin thin, silky, zoned, greyish, 1–4 in. across ; pores minute, elongated and very wavy, greyish.

On dead trunks.

*D. unicolor*.—Broadly effused, thin, usually with many imbricated or overlapping free portions, velvety, zoned, grey ; pores long, wavy, plates often broken up into teeth.

Often 3–6 in. wide and extending in an imbricated manner for a foot or more.

On trunks, stumps, rails, posts, etc.

*D. latissima*.—Resupinate, broadly effused, pale wood-colour, thickish ; pores narrow, some long and very wavy, others roundish. Often extending for a foot or more as a continuous sheet.

On dead wood.

*D. vermicularis*.—Adnate, thin, pores short, wavy, flesh-colour with a reddish tinge.

Broadly effused on the ground, fixed by fibres.

*D. ferruginea*.—Adnate or partly free, yellowish rust-colour ; pores narrow, wavy, with a broad, smooth margin all round, rusty brown.

More or less circular in outline,  $\frac{1}{2}$ -- $1\frac{1}{2}$  in. across.

### MERULIUS

Somewhat soft and subgelatinous when moist ; hymenium variously wrinkled or fold-like, the ridges or wrinkles running together to form an irregular network.

Differs from *Poria* in the vague and irregular nature of the pores and in being subgelatinous.

*M. lacrymans*.—Broadly effused, thick, soft and moist, rich orange-brown, irregularly wrinkled, margin white and cottony, becoming greyish, and often running out in long strands ; spores brown.

On trunks, worked wood. Very destructive to wood in houses that are badly ventilated.

*M. læticolor*.—Adnate, bright orange, edge downy, white ; hymenium at first even, then slightly wrinkled, 1–2 in. across.

Running over sawdust, leaves, etc.

*M. molluscus*.—Adnate, thin, soft ; hymenium with ridges forming shallow pits, flesh-colour, margin downy, white.

One edge is sometimes free and reflexed.

On wood and branches.

*M. tremellosus*.—Soft and cartilaginous, edge free, upturned, usually ragged and radiating ; hymenium variously wrinkled and porous, whitish and opalescent, becoming tinged brown, 1–3 in. across.

The edge is often tinged rose-colour.

On wood.

*M. corium*.—Effused, upper edge or all round free and upturned, whitish and silky underneath ; hymenium slightly wrinkled, pale ochre to tan, often with a pink tinge.

Very variable in size and colour, but known by the white, silky under surface and the pale ochraceous hymenium.

*M. aurantiacus*.—Adnate and partly reflexed, under surface coarsely tomentose, tough ; hymenium orange, somewhat wrinkled and porose, about 1 in. across.



Allied to *M. corium*, but distinguished by the orange hymenium. On dead trunks, etc.

*M. carmichaelianus*.—White, very thin, adnate, wrinkles of hymenium very slightly raised and forming a fairly regular network; patches 1–3 in. across.

Very thin, differing from *Poria* in the very shallow pores. On dead bark, etc.

*M. serpens*.—Crusty, adnate, inseparable from the matrix, pallid, then reddish, edge byssoid; hymenium with the wrinkles at first free, then anastomosing and forming variously formed, very shallow pores.

On rotten pine wood. Extending in a wavy manner for 2 in. or more.

*M. pallens*.—Closely adnate, fleshy, somewhat gelatinous, thin, not separable from the matrix, edge indeterminate; folds of the hymenium forming minute, shallow pores.

On wood of fir, oak, etc.

*M. rufus*.—Closely adnate, often effused for 1–3 in., substance smooth, soft, reddish flesh-colour, sometimes with a purplish tinge, edge almost smooth; hymenium distinctly and equally porous.

General appearance and hymenium of a *Poria*, but differs in the soft nature of the hymenophore.

On dead wood.

*M. porinoides*.—Thin, closely adnate, edge byssoid, white; hymenium dingy yellow, the folds or wrinkles forming small pores.

Often forming patches 1–3 in. across.

On dead wood, bark, chips, etc.; also running over the ground.

*M. himantioides*.—Effused, very soft, silky, edge byssoid; hymenium dingy yellow or with an olive tinge, folds irregular, forming vague pores.

Somewhat resembling *M. lacrymans*, but the substance is thinner, and not pulverulent.

On pine wood, etc. Sometimes running over living plants, club-mosses, etc.

#### HYDNACEÆ

This family is well distinguished by the hymenium or spore-bearing surface being covered with spines or warts, on which the spores are borne. In the most highly developed forms, as *Hydnum*, the spines are long and awl-shaped or like a porcupine's quill, tapering to a sharp point, and in some instances  $\frac{1}{2}$ –1 inch in length. In other genera, instead of spines more or less flattened, plate-like structures are present, resembling so many miniature planks projecting from the hymenium. Again, in the more primitive genera, as *Grandinia*, *Porothelium*, etc., the hymenium is densely covered with very minute rounded warts, only distinguishable under a good

pocket lens ; in fact, without a lens the characters even of generic rank cannot be seen in many instances.

In the *Thelephoraceæ* it will be remembered that the hymenium is in all typical forms quite smooth or devoid of any specialized projections or outgrowths of any kind, only in the genus *Craterellus* the hymenium shows vague, vein-like wrinkles or folds, thus forming a transition to the present family through the genus *Phlebia*, where the hymenium is distinctly wrinkled or veined, and in some species the slight veins or folds are covered with minute warts. From this starting point the warts on the hymenium gradually increase in length until the crowded long spines of *Hydnum* is reached, which is the extreme of hymenial evolution attained to in the *Hydnaceæ*.

In like manner there is a perfect sequence in the evolution of the hymenophore from the primitive crust-like patches of *Grandinia*, closely adherent throughout to the substance upon which they are growing, through species of *Irpex*, where one edge of the sporophore is free from the matrix, and more or less reflexed, until central-stemmed species of *Hydnum* furnished with a cap, resembling a toadstool in build, is reached.

#### KEY TO THE GENERA

\* *Spines sharp-pointed.*

Fungus with a cap and central stem, dimidiate or forming an inseparable crust on wood ; spines sharp-pointed, free from each other at the base. *Hydnum.*

Forming crust-like patches on wood ; spines springing from wrinkles that form an irregular network on the surface of the hymenium. *Irpex.*

Forming a crust, texture of hymenium from which the spines spring, loose and fibrous ; spines minute. *Caldesiella.*

Forming a thin crust, covered with very minute spinules.

*Kneiffia.*

Spines very slender, apparently springing directly from the wood.

*Mucronella.*

\*\* *Outgrowths of the hymenium either subcylindrical, blunt tubercles or flattened, tooth-like, irregular plates.*

With a cap and more or less central stem ; teeth flattened, irregular. *Sistotrema.*

Forming crust-like patches on wood, outgrowths of hymenium subcylindrical, coarse, blunt-ended. *Radulum.*

\*\*\* *Outgrowths of hymenium consisting of crowded, minute warts.*

Forming thin crusts on wood ; hymenium covered with minute rounded warts. *Grandinia.*

Forming thin crusts on wood ; hymenium covered with minute warts, the tips of which are fringed with spinules. *Odontia.*



Forming extended crusts on wood ; warts more or less elongated, with a cavity or depression at the tip. *Porothelium*.

Forming subgelatinous crusts, the surface covered with radiating, irregular wrinkles or veins, which are sometimes covered with warts. *Phlebia*.

## NOTES ON THE GENERA

### HYDNUM

So long as we have to deal with species having a regular cap and a central stem, with spines on the under surface of the cap, in place of gills, there can be no mistake as to the genus *Hydnum*. The same is true of those stemless species growing out of wood. It is when we come to the truly adnate species, of which there are many, forming a thin crust, everywhere attached to the substratum by the under surface, and covered by spines on the free, upper surface, that the trouble commences. It is characteristic of the genus *Hydnum* that the spines are free from each other at the base, and that they spring from a flat surface ; that is, they do not originate from wrinkles or ridges, as in *Irpex*. In *Grandinia*, which might be mistaken for a reduced, adnate species, the outgrowths are rounded and wart-like, as they are also in *Porothelium*, where each minute wart has a little indentation at its tip. It is important to remember that in *Hydnum* the spines should be sharp-pointed and should spring from an even surface. One of the larger species, *H. repandum*, is edible. Some species are destructive parasites on timber and fruit trees.

So far as at present known, the head-quarters of this genus is in Sweden. More species are known from that country than from all the rest of the world combined.

### IRPEX

In this genus the teeth are coarser, often flattened, and not so uniformly sharp-pointed as in *Hydnum*. The most important point of distinction between the two genera, however, consists in the origin of the spines from the cap. As already pointed out, in *Hydnum* the spines originate from a flat surface ; whereas in *Irpex* they either arise from slightly raised ridges, when they are arranged in irregular rows, or from ridges anastomosing to form an irregular network. There are no species with a central stem ; the highest forms are more or less resupinate and free above, an adnate portion running down the matrix, or altogether adnate. All grow on wood.

### CALDESIELLA

Our single species is entirely adnate throughout, forming a very thin layer of loose texture, densely covered with erect or oblique, acute or compressed, slender spines. Cannot be mistaken for any

other genus, if attention is paid to the very thin, tomentose flesh from which the spines originate. Colour rusty or brownish.

#### KNEIFFIA

Entirely adnate to the substratum. Crust very thin, sometimes subgelatinous, destitute of granules or warts, but bearing scattered or tufted, very minute, slender bristles. Often very wide-spreading, thin and encrusting, or growing out of cracks in bark, and assuming various forms. Superficially resembling *Grandinia granulosa*, but distinguished under a pocket lens by the bristle-like spines instead of warts.

#### MUCRONELLA

Sporophore or flesh almost wanting. Resembling *Hydnum* in the sharp-pointed spines, but differing very materially in the almost entire absence of flesh, from which the spines originate in *Hydnum*. The spines are slender, scattered or fasciculate, when they are more or less connected at the base, and appear to be springing almost directly from the matrix, up to 1 in. in length.

#### SISTOTREMA

In this genus we find an attempt at a cap supported on a more or less central stem. The caps are small, and as the plants usually grow in clusters the caps grow into each other, so that we have an irregular growth of caps supported on several stems. The teeth or spines appear on the under surface of the cap, and are very irregular in form, often flattened and toothed. Our one species grows on the ground.

#### RADULUM

Sporophore resupinate, vaguely effused or forming roundish patches on bark, etc. The spines take the form of coarse tubercles or finger-like, blunt outgrowths, more or less elongated. Distinguished among allies by the large, deformed, elongated, blunt tubercles.

#### GRANDINIA

Forming thin, crust-like expansions on bark and wood, having the entire surface covered with minute warts or granules, only clearly observed under a pocket lens. Warts entire, smooth, usually indented at the tip.

#### ODONTIA

Entirely adnate and often wide-spreading on bark and wood. The flesh consists of thin, interwoven hyphæ traversed by prominent branching veins, and having the surface covered with minute warts, the warts being minutely spinulose or with a cluster of bristles at the tip, a feature only to be seen under a good pocket lens.



## POROTHELIUM

Forming thin, entirely adnate crusts on wood and bark. The surface is entirely covered with minute granules, which become perforated or dimpled at the apex.

## PHLEBIA

Entirely adnate or with the edge more or less free and projecting from the matrix, often rather soft and subgelatinous, the surface covered from the first with crowded, irregular, small wrinkles or ridges that have usually an entire edge, and often have a tendency to radiate on all sides from the centre towards the edge. Liable to be confounded with some of the simple, resupinate species of *Merulius*, but in *Phlebia* the ridges do not anastomose, or run into each irregularly, to form shallow pores or pits, as they do in *Merulius*.

## HYDNUM

The most perfect species have a cap and a central stem, hymenium on the under surface ; the simplest forms are entirely resupinate with the hymenium uppermost ; hymenium covered with pointed spines free from each other at the base.

This genus requires to be carefully distinguished from *Irpex*, its closest ally. In *Hydnum* the spines spring from a flat base ; whereas in *Irpex* the spines spring from more or less raised ridges or wrinkles present on the hymenium.

1. *Stem present, central or nearly so.*

*H. imbricatum*.—Cap 3–4 in. across, dusky, with overlapping scales ; stem 1–3 in. long, stout, of equal thickness ; spines pale grey,  $\frac{1}{4}$ – $\frac{1}{2}$  in. long.

Known by the scaly cap and stout stem.

On the ground in pine woods.

*H. squamosum*.—Cap smooth at first, then irregularly scaly ; stem short, white, narrowed below ; spines greyish brown.

Differs from *H. imbricatum* in the white stem tapering downwards.

On the ground in pine woods.

*H. scabrosum*.—Cap very fleshy, top-shaped, then flat, rusty umber, downy, then becoming broken up into squamules, 3–4 in. across ; stem stout, grey, blackish below ; spines crowded, brownish.

On the ground amongst pines.

*H. lævigatum*.—Cap smooth, dusky, 4–7 in. across ; stem pale brown ; spines pale brown, crowded, thin, about  $\frac{1}{4}$  in. long.

On the ground in pine woods.

*H. fragile*.—Cap fragile, edge wavy or lobed, pale, then grey or often brick-red, almost smooth, 4–7 in. across, often zoned ; stem smooth, greyish, stout ; spines  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, whitish, then grey.

Distinguished from *H. lævigatum* by the wavy or lobed edge of the cap and the fragile substance.

On the ground under pines, heather, etc.

*H. repandum* (Pl. XXVII, fig. 7).—Cap fleshy, often irregular and more or less lobed, pale dull opaque yellow, almost smooth, 2–4 in. across ; stem short, stout, pale ; spines short, brittle, pale.

In woods on the ground. Edible.

*H. rufescens*.—Every part rufescent, thinner than *H. repandum*, of which it is considered by some as a variety.

*H. acre*.—Cap fleshy, top-shaped, depressed, yellowish ochre, centre darker ; stem short and thick, darker than cap ; spines greyish yellow. Pungent taste.

Known by the hot, acrid taste.

Sandy pine and chestnut woods.

*H. compactum*.—Cap irregular, greyish olive or brownish, corky, 3–6 in. across ; stem short, often crooked ; spines short, brownish.

Cap often very irregular, and stem almost obsolete.

Among conifers, heather, etc.

*H. aurantiacum*.—Cap orange-yellow, corky, 2–6 in. across ; stem stout, orange ; spines whitish, then tinged brown.

In pine woods.

*H. ferrugineum*.—Cap becoming flat or depressed, corky, rusty, 1–4 in. across ; stem 2–3 in. long, rusty brown ; spines thin, short, rusty.

On the ground in pine woods.

*H. scrobiculatum*.—Entirely rusty. Cap convex, then depressed, downy, centre slightly scaly ; stem short, often rooting ; spines short, fragile, running partly down the stem.

Gregarious and often growing into each other.

On the ground in pine woods.

*H. zonatum*.—Entirely rusty. Cap 1–2 in. across, zoned, radiately wrinkled ; stem slightly scaly ; spines short, slender.

Differs from *H. scrobiculatum* in the zoned, wrinkled cap.

On the ground in pine woods.

*H. nigrum*.—Cap blackish blue, corky, downy, and tuberculose, 2–4 in. across ; stem stout, black, rooting ; spines short, whitish ; flesh black.

In pine woods. Often growing into each other.

*H. graveolens*.—Cap leathery, thin, wrinkled, blackish brown, edge whitish, grey when dry, 1–1½ in. across ; stem slender, dark ; spines grey, running down the stem. Smell like melilot.

In pine woods. Scent retained for years.

*H. melaleucum*.—Cap flat, irregular, rigid, striate, black, edge white, 1–2 in. across ; stem slender, black ; spines short, whitish.

Distinguished from *H. graveolens* by absence of smell.

In pine woods.



*H. cyathiforme*.—Cap almost funnel-shaped, thin, pale grey, edge white; stem slender, grey; spines short, whitish, crowded.

In fir woods.

2. *Stem attached to edge of cap.*

*H. auriscalpium*.—Cap kidney-shaped, thin, hairy, dark brown,  $\frac{1}{2}$ – $\frac{3}{4}$  in. across; stem slender, dark, 2–3 in. long; spines dark.

Our only *Hydnum* with a truly lateral stem.

On fallen fir cones and among fir leaves.

3. *Cut up into many branches, or forming a solid tubercular mass bearing the spines.*

*H. coralloides*.—Pure white, dingy with age, divided into many tapering, interwoven branches, bearing long spines on one side.

Often forms coralloid or cauliflower-like tufts, 6 in. to half a yard across.

On decayed wood.

*H. erinaceum*.—White, then yellowish, fleshy, irregularly tuberculose, pendulous, fibrillose; spines pendulous, crowded, 1–2½ in. long.

*H. caput-medusæ*.—Forming a tubercular mass tapering to the point of attachment, white, then greyish, covered all over with spines, those on the upper surface small and distorted, those on the under surface  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, straight.

On trunks.

4. *Sessile and attached by a broad base, horizontal.*

*H. cirrhatum*.—Fleshy, often imbricated, white tinged yellow or reddish, upper surface with curly, abortive spines; under spines  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, pale, 2–4 in. across.

On trunks.

*H. diversidens*.—Irregularly tuberculose, 2–3 in. across, whitish or tinged yellow; upper surface with erect, notched teeth, edge with club-shaped outgrowths; under spines 3–6 lines long.

Often very irregular in form.

On trunks and stumps.

*H. ochraceum*.—Thin, leathery, ochraceous, zoned, partly or sometimes entirely resupinate; spines minute, ochraceous.

Readily separable from the wood.

5. *Entirely resupinate or adnate to the matrix.*

\* *Spines brown or rusty.*

*H. squalinum*.—Substance pale wood-colour, firm, leathery, thick, somewhat circular, 2–3 in. across; spines crowded, stout, compressed, ferruginous, then brownish, 3–4 lines long.

On trunks, etc.

*H. membranaceum*.—Thin, 1–2 in. across; spines acute, about 1 line long.

Sometimes paler and yellowish. Not separable.

On fallen branches.

*H. molluscum*.—Very thin, readily separable from the wood ; spines short, slender, reddish.

On wood.

*H. weinmanni*.—Thin, buff with a grey tinge ; teeth sharp, not a line long.

On branches and rotten wood, especially poplar.

*H. crinale*.—Very thin, texture fibrillose, umber or with a rusty tinge ; spines hair-like, crowded, 1–2 lines long.

*H. variicolor*.—Substance white, forming a scurfy, adnate, inseparable crust spreading for 1–2 in. ; spines very minute, crowded, conical, unequal, brownish, usually more or less pressed down.

On trunks, especially oak.

\*\* *Spines yellowish or greenish.*

*H. aureum*.—Every part golden yellow ; spines crowded, about 1 line long ; 1–2 in. across.

On dead branches.

*H. denticulatum*.—Substance longitudinally effused, often for several inches, rather mealy, bright yellow ; spines the same colour, crowded, slightly toothed here and there.

On rotten wood.

*H. alutaceum*.—Substance longitudinally effused for several inches, crusty, inseparable, edge naked, pale ochraceous ; spines similarly coloured, minute, crowded, unequal, acute.

Resembling *Grandinia granulosa* in colour and general appearance, but quite distinct in the acute spines.

On dead wood.

*H. sordidum*.—Substance effused, often for many inches, thin, readily separating from the matrix, dingy yellow, edge irregularly porous, sulphur-yellow ; spines very much crowded, often tufted, compressed and torn, subacute, 1–1½ lines long.

On rotten wood.

*H. viride*.—Substance broadly effused, softly tomentose, green, becoming yellowish with age ; spines straight, about 1 line long, rather thick, irregular, more or less toothed, green.

Often extending in patches 8–10 in. long.

On rotten wood.

*H. limonicolor*.—Substance closely adnate, bright citron-yellow ; spines crowded, acute, short, mycelium white, scanty or sometimes almost obsolete.

Distinguished from its nearest ally, *H. sepultum*, in the exceedingly scanty flesh and in the absence of a persistent, white, barren margin.

On stones buried among pine leaves, etc.

*H. spathulatum*.—Substance yellowish white, effused, membranaceous, separable, circumference fringed, under surface downy ; spines flattened, oblique, orange.



Forming patches 1-2 in. across ; spines 1-2 lines long. In some specimens flattened and awl-shaped spines are mixed. Spines sometimes scarcely orange.

On decaying wood.

*H. multiforme*.—Substance very pale buff or whitish, at first smooth and resembling a *Corticium*, at length bearing spines here and there in clusters, which are either awl-shaped or more or less flattened and fimbriated.

Rather broadly effused, inseparable, edge often thin and indeterminate or vague, waxy, and becoming cracked when dry. Perhaps may prove to be a morbid species of *Corticium*.

On dead wood.

*H. anomalum*.—Substance pallid light yellow, thin, gelatinous ; spines in the form of granules, then stalked and obtusely divided upwards.

Possibly not a good species.

On the inside of a very much decayed ash tree.

*H. melleum*.—Substance honey-colour, effused, thin ; teeth acute, sometimes divided at the apex, basal portion and the crust pulverulent.

Forming a very thin, honey-coloured film, margin minutely byssoid ; spines about 1 line long, often scattered, stout and blunt, or slender and acute, or blunt and divided at the tip.

On fallen rails.

*H. sepultum*.—Substance golden yellow, edge white ; spines acute, about 1 line long.

Forming little scattered patches. Distinguished from other adnate yellow species by the persistent, white, sterile margin.

On stones buried among pine leaves.

\*\*\* *Spines flesh-colour, lilac, or rufescent.*

*H. udum*.—Substance flesh-colour, then pale yellowish, subgelatinous, spreading for several inches ; spines crowded, unequal, about 1 line long, awl-shaped or compressed, simple or toothed, coloured like the crust.

Forming elongated, dingy, subgelatinous patches on dead branches, not separable from the matrix. When dry it is yellowish towards the edge, the central portion becoming a pale fawn-colour.

On dead branches, etc.

*H. bicolor*.—Substance white, very thin, spreading for many inches, very thin, inseparable ; spines about half a line long, basal portion white and downy, tips dark brown, smooth.

Superficially resembling reddish forms of *H. farinaceum*, but when examined in a living condition seen to be quite distinct.

On pine wood, etc.

\*\*\*\* *Spines white, often tinged yellow or grey when old.*

*H. nodulosum*.—Substance whitish, smooth, inseparable, forming very broad patches, nodulose ; spines long, depressed on the flat portions, pendulous on the lower side of the nodules, upper side of the nodules without spines.

Often very broadly effused, nodules or lumps on the crust, variable in size, sterile above, and bearing pendulous spines on the under or lower surface.

On trunks, fir stumps, etc.

*H. stevensoni*.—Substance white, mealy beneath, here and there byssoid ; spines cylindrical, blunt or truncate, sometimes compressed, powdery at the tip, about  $1\frac{1}{2}$  lines long.

Often forming patches 2–3 in. long, very thin ; spines rather crowded, several often joined together at the base.

On dead wood, encrusting leaves, moss, etc.

*H. niveum*.—Substance white, forming patches 2–3 in. across, very thin, inseparable, edge byssoid ; spines crowded, short, equal, smooth, white, minute.

Distinguished by the clear white colour of every part when growing, becoming pallid when dry.

On dead wood, etc.

*H. farinaceum*.—Substance white, spreading in patches which end vaguely, thin, mealy ; spines thin, rather distant, very sharp, quite entire, minute.

Forming thin, spreading patches resembling scattered meal, studded with scattered, acute spines. Sometimes yellowish.

On rotten wood, especially pine.

*H. argutum*.—Substance white, patches vague, scattered, mostly consisting of loosely interwoven hyphæ ; spines awl-shaped, acute, unequal, minutely toothed.

Distinguished by the loose texture of the crust.

On wood and bark.

*H. stipatum*.—Whitish. Often forming large patches, very thin, minutely powdery, forming an inseparable crust ; spines crowded, blunt, granule-like, minutely toothed.

Often forming large patches. Sometimes pale dingy yellow. The edge is either sterile or covered with spines. Colour sometimes pale yellowish or very pale buff.

On rotten wood.

#### IRPEX

Somewhat resembling *Hydnum*, but the spines are not so uniformly awl-shaped and pointed, and spring from raised bands or ribs, which sometimes anastomose to form an irregular network.

Substance often somewhat tough or cartilaginous. Teeth or spines not separable from the cap, and not torn or notched.



*I. pendulus*.—Cap very thin, attached by a broad or narrowed base, white, elastic, wrinkled or minutely scaly, pendulous, 1–2 in. across, more or less circular ; teeth in irregular rows, about 1 line long, shining white.

On pine wood.

*I. spathulatus*.—Broadly effused, inseparable, whitish, edge downy ; teeth irregularly flattened, coarse, 2–3 lines long, springing from a network of raised ribs.

Often effused for several inches.

On larch wood, etc.

*I. obliquus*.—White or pallid, inseparable, patches several inches across ; teeth oblique, often split or torn, 2–3 lines long, springing from a network of raised ribs.

Forms irregular patches on stumps, dead branches, etc. Round the edge there are more or less rounded pores, but towards the centre the flattened teeth are oblique and overlap each other. White at first, then brownish.

*I. carneus*.—Thin, soft and cartilaginous, reddish, 2–3 in. across ; teeth conical, entire, united at the base.

On wood and bark.

*I. johnstoni*.—Pure white, resupinate, thin, separable ; teeth compressed, unequal, in irregular rows, springing from folds.

On dead beech, etc.

*I. deformis*.—Thin, white, effused, several inches across ; teeth crowded, awl-shaped, 1–2 lines long, springing from folds that join to form an irregular network.

Resembling a *Poria*, with the pores torn into shreds.

On wood.

*I. fusco-violaceus*.—Effuso-reflexed, thin, tough, silky, zoned, greyish ; teeth flattened, torn at the tips, in irregular rows, dingy violet.

On dead pine trunks, which it often nearly covers. Entirely adnate or partly free and reflexed. Becomes pale tan-colour when old and dry.

#### CALDESIELLA

Resupinate, substance very thin, texture loose and fibrous ; spines minute, conical.

The true nature of this genus is uncertain ; superficially it resembles a resupinate *Hydnum*, but the substance or flesh from which the spines originate is very loose in texture.

*C. ferruginosa*.—Effused for several inches, and separable from the matrix, tomentose, rusty brown ; spines crowded, acute, short, rusty brown.

The fungus consists of a densely woven, very thin, indeterminate felt, covered with erect or oblique spines.

On dead wood, more especially under loose bark.

## KNIEFFIA

Crusty patches destitute of warts or granules, but bearing minute scattered or clustered bristles, when seen under a pocket lens.

Usually forming thin, irregular crusts or growing out of cracks in bark. The spines consist of a bundle of hyphæ; whereas in *Peniophora* and *Hymenochæte* the spines on the hymenium each consists of a single large cell.

*K. setigera*.—Usually effused for 1–3 inches, rather thick and fleshy or a mere film, white, then pale buff; bristles very minute, scattered.

Distinguished from species of *Grandinia* by the presence of delicate spines instead of warts.

On wood and bark.

*K. subgelatinosa*.—Thin, subgelatinous, yellowish, then pale buff; spines very minute, scattered.

Forming a very thin, broadly effused, subgelatinous film.

On fir stumps.

## MUCRONELLA

The patches are reduced to dense clusters of very delicate upright, tapering spines, the substance from which they originate not being compacted into a membrane.

*M. calva*.—Spines  $\frac{1}{2}$ –1 in. long, very slender, tapering to a sharp point, whitish, then grey, quite smooth and even, erect.

Forming patches on rotten pine and other kinds of wood. A doubtful production not at all well understood. May possibly prove to be a mould or a condition in the life-cycle of some other fungus.

## SISTOTREMA

Fleshy, cap supported on a more or less central stem; teeth inferior, flattened, irregular, toothed, readily separating from flesh of cap.

Differs from *Hydnum* in the very irregular spines, which are often flattened and jagged.

*S. confluens*.—Cap fleshy, irregular, downy, white, up to 1 in. across; stem about 1 in. long, tapering downwards, often more or less excentric in position; gill-like plates or teeth on under surface, entire or toothed.

Gregarious or crowded. Very often several caps are grown together to form an irregular mass. Becoming tinged buff or brownish.

On the ground.

## RADULUM

Resupinate, vaguely effused and forming nodulose or warted crusts bearing blunt tubercles or finger-like outgrowths.



In this genus the well-formed spines present in *Hydnum*, or the plate-like teeth in *Irpex*, are replaced by more or less elongated, deformed, tubercular outgrowths.

*R. pendulum*.—Effused for 2–3 in. or more, bursting through cracks in the bark, whitish, upper edge slightly reflexed, thickish, soft; tubercles about 1 line long, irregular, pendulous.

On alder, pine, birch, etc.

*R. orbiculare*.—Suborbicular, several patches frequently growing into each other, white or tinged dull yellow, edge downy; tubercles more or less cylindrical, scattered or in clusters, about 1 line long.

Tubercles often pendulous or adpressed. Often becoming dingy flesh-colour the second season.

Bursting through dead bark of various trees.

*R. quercinum*.—Closely adnate, subcircular, then irregularly effused for several inches, white, then pallid or tinged flesh-colour; tubercles stout, 2–3 lines long, often in clusters, tips minutely spinulose.

Distinguished by the spinulose or villose tips of the tubercles. Patches sometimes a foot or more broad, edge fringed, white.

On wood, more especially oak.

*R. tomentosum*.—Irregularly effused for 1–3 in., rather thick, whitish, edge more or less free and erect, downy; tubercles short, crowded, irregular in form, often growing to each other.

On various trees, also on sawdust.

*R. deglubens*.—Orbicular, about  $\frac{1}{3}$  in. across, edge broadly free and upturned, flesh-colour with a rusty tinge; tubercles about 1 line long, very irregular, cylindrical or plate-like and toothed.

On ash.

*R. corallinum*.—Effused for 2–3 in., whitish, thin, shining; tubercles scattered in clusters, irregular, coralloid, 2–3 lines long.

On oak branches.

*R. epileucum*.—Effused for several inches, very thin, entirely adnate, waxy, polished, pale ochre; tubercles sparingly scattered, variable in size, up to 2 lines in length, brittle, tips often fimbriated.

On naked wood.

*R. fagineum*.—Bursting through the bark, broadly effused, edge velvety, rusty orange; hymenium whitish; tubercles irregular.

On dead beech. Surrounding the branches and resembling stalactite.

#### GRANDINIA

Forming thin, white, effused crusts, which, seen under a lens, are covered with crowded, minute warts usually having the tips slightly indented.

Soft, encrusting fungi, thin, presenting a minutely granular surface, warts globular or hemispherical, regular, smooth.

*G. granulosa*.—Thin, waxy, whitish or pale buff, often effused for several inches ; granules minute, crowded.

On dead wood and branches.

*G. papillosa*.—White, very thin, easily separable from the matrix, becoming much cracked ; warts crowded, minute, almost globose.

Patches 1–2 in. across, separable as a very thin film.

On dead trunks.

*G. ocellata*.—Patches livid with a dull purple tinge, edge indeterminate, sterile ; warts obtusely conical, tips becoming collapsed, unequal in size.

On trunks. Not cracking when dry.

*G. crustosa*.—Often forming a crust extending for several inches, white or with a yellow tinge, thin, rather mealy ; warts minute, crowded, unequal, subglobose, often collapsing at the apex.

On bark of willow, pine, etc., also sometimes encrusting the larger fungi, *Polyporus*, etc.

*G. mucida*.—Patch somewhat gelatinous when moist, corrugated when dry, pale dull yellow, effused for several inches ; warts rather large, unequal, soft, hemispherical.

Often forming large patches. Subgelatinous when moist, becoming wrinkled when dry.

On rotten wood.

#### ODONTIA

Forming crusty patches on wood, consisting of interwoven strands, dry, surface not waxy-looking ; surface covered with minute warts or spines, cristate or spinulose at the tips (when seen under a good lens).

Distinguished by the warts or spines having the tips penicillate or crested with a tuft of minute spines and by the dry substance.

*O. fimbriata*.—Crust usually a beautiful fawn-colour or pale buff, sometimes tinged lilac, thin, substance traversed by prominent branching veins, edge fringed ; surface crowded with small granules with fringed tips.

Patches often very large, sometimes more or less covering fallen trunks, stumps, etc.

*O. barba-jovis*.—Crust white, then pale yellowish tan, thin, dry ; warts conical, up to  $\frac{1}{4}$  in. long, with an orange fringe at the tip.

Often forming patches up to a foot across, edge downy, white. Differs from *Radulum quercinum* in the fimbriated orange tips of the spines or warts.

On decaying fallen wood, often on its under side.

#### POROTHELIUM

Entirely resupinate, thin, covered with small warts that are distinctly perforated or sunken at the tips.



Differs from *Grandinia* in the warts being more distinctly hollowed at the tip or apex.

*P. keithii*.—Forming thin, inseparable, subgelatinous patches 1–2 in. across, pale umber, edge somewhat powdery; warts scattered, short, at length collapsing, centre gelatinous.

Known amongst British species by the dingy pale umber-colour and subgelatinous consistency when growing.

On dead fir.

*P. friesii*.—Forming effused, thin, inseparable white or pale ochraceous patches of irregular form, 1–3 in. across, edge sterile, fibrillose; warts immersed in the substance, perforated at the apex, scattered, yellowish, at length expanded.

On bark and wood.

*P. confusum*.—Patch thin, pallid, waxy-looking and polished, edge downy; warts scattered, very short, tip excavated.

On wood, sticks, etc.

*P. stevensoni*.—Patch rather thick, somewhat gelatinous when moist, whitish, edge coarsely fibrillose, becoming smooth; warts distinct, scattered, not  $\frac{1}{4}$  line high.

When growing each wart is usually crowned by a yellow, limpid globule consisting of resin derived from the wood on which the fungus is growing.

On decayed pine rails.

#### PHLEBIA

Rather soft and subgelatinous, resupinate, entire surface covered with irregular, crowded wrinkles or ridges with an even edge.

Forming rather fleshy, much wrinkled crusts or patches on wood. Often large and brightly coloured. Subgelatinous when moist.

*P. merismoides*.—Broadly effused, thin, soft, flesh-colour when moist, becoming dingy and tinged purple, margin fibrous, orange; wrinkles thin, crowded, not anastomosing to form an irregular network, 3–4 in. across.

The irregularity of the surface depends on the form of the substance it grows upon.

On bark and wood, running over moss, etc.

*P. radiata*.—At first more or less orbicular, edge with radiating fibrils, reddish flesh-colour or almost orange; folds or wrinkles thin, crowded, radiating from the centre, 3–4 in. across.

On dead wood and bark.

*P. contorta*.—Closely allied to *P. radiata*, differing in the branched and contorted wrinkles of the hymenium.

On dead wood.

*P. vaga*.—Effused, greyish yellow, sometimes with a lilac tinge, edge fibrillose, wrinkles slender, much interwoven, covered with minute warts.

Distinguished by the minutely papillose or warted ridges.  
On dead wood.

*P. lirellosa*.—Resupinate, edge free, greyish umber; wrinkles thin, straight, branches, sometimes anastomosing to form pores.  
On wood, branches, etc.

### THELEPHORACEÆ

In this family the substance is dry, often open and fibrous in texture, and includes some of the most primitive members included in the large group called Basidiomycetes. The large genus *Corticium* shows least differentiation in structure, being entirely attached or adnate to the substance upon which it is growing, many species being so thin in substance that they closely resemble a more or less extended patch of paint on the wood. In this genus the hymenium or spore-bearing surface, which covers the entire exposed surface of the fungus, is perfectly smooth and on this point we must come to a clear understanding. When a surface is described as smooth, it does not mean that it is flat, but that it is neither downy, bristly, warted, etc.; hence a smooth surface may be wavy, crumpled, etc., such markings being included under the term uneven; it follows that an uneven surface may be smooth, or glabrous. In the genera *Peniophora* and *Hymenochaete* the general appearance and habit is that of *Corticium*, but when carefully examined under a good pocket lens the hymenium is seen to be covered with minute erect bristles or cystidia. At this point it may be necessary to repeat the warning as to the importance of minute details. It may appear a trifling matter as to whether the hymenium is smooth, or so minutely bristly as only to be observed under a good lens, yet this point is of importance.

In the genera *Stereum* and *Thelephora* the simplest forms are altogether attached to the substance they grow upon. In other species a portion of the fungus becomes free and bends away from the support, and this condition of freedom from the support becomes more and more marked, until finally the pileus assumes a more or less mushroom-like or funnel-shape, supported on a central stem with the hymenium on the under surface. Finally, in *Craterellus* the fungus grows erect and is narrowly funnel-shaped with a wavy, turned-over edge or margin. The hymenium covers the outside of the funnel and shows slightly raised, irregular ribs, which shadow in the gradual evolution of true gills, as occurring in the genus *Cantharellus*, placed amongst the true gill-bearing species, and to the family Hydnaceæ through the genus *Phlebia*.



## KEY TO THE GENERA

Substance soft, gelatinous, and encrusting various substances.

*Aldridgea*.

Resupinate, dry, and powdery ; spores coloured. *Coniophora*.

Resupinate, hymenium smooth, becoming cracked ; spores colourless. *Corticium*.

Resupinate ; hymenium minutely bristly ; bristles colourless.

*Peniophora*.

Resupinate ; hymenium minutely bristly ; bristles coloured.

*Hymenochaete*.

Fungus more or less free from its support and recurved ; spores colourless. *Stereum*.

Closely resembling a *Stereum* in general appearance ; differing in having a more or less wrinkled hymenium. *Cladoderris*.

Fungus more or less free from its support ; hymenium brownish ; spores coloured. *Thelephora*.

Cup-shaped or pipe-head-shaped and pendulous, minute. *Cyphella*.

Cylindrical, in crowded patches. *Solenia*.

Funnel-shaped, blackish, large, tufted. *Craterellus*.

Parasitic on rhododendron leaves. *Exobasidium*.

## NOTES ON THE GENERA

## CONIOPHORA

All the species form more or less broadly effused crusts or patches on bark and wood. The entire patch is closely adnate or attached to the substratum, and there is not the slightest tendency on the part of the margin to become free or raised. The hymenium is always perfectly smooth and even, but when growing over the rough surface of bark, etc., the very thin substance of the fungus follows the inequalities of the matrix, which gives it an uneven appearance. The hymenium is dry, and often powdery from the spores, and in some species it is sprinkled with glistening particles. The patches, as in other adnate fungi, increase in size by the gradual extension of the edge or margin, all the way round, and the character presented by the margin is often a point of specific importance. When the margin gradually thins away and becomes vague and ill-defined, it is said to be indeterminate ; when well-defined, the margin is determinate, and then the outwardly extending hyphæ present very different appearances in different species. The colour of the growing border is usually different to that of the central part, or hymenium, and should be noted when fresh. The hymenium is usually some shade of yellowish brown ; the radiating margin is in some species bright yellow.

## ALDRIDGEA

Recognized by having a soft and subgelatinous consistency when growing, collapsing and becoming rigid when dry. The species

often form irregular crusts, or spread in nodulose masses over various substances. Some are whitish in colour, others brownish or purplish.

#### CORTICIUM

Forming broadly effused, completely adnate crusts on wood and bark, or very rarely with the extreme edge free. Hymenium waxy, smooth, even, usually presenting a polished appearance, becoming cracked when dry, due to contraction. The uneven or nodulose appearance sometimes met with is due to the fungus following closely the irregularities of the matrix upon which it is growing. Somewhat difficult to separate from species of *Stereum*. In the last-named genus, however, some portion is usually free from the substratum or matrix, and the upper or sterile surface of such free portion is always densely velvety or strigose; and, further, the hymenium in *Stereum* does not crack during drying.

#### PENIOPHORA

Forming large crusts or patches on wood, bark, which may be entirely adnate or attached to the matrix throughout, or one edge may be free and spreading away from the matrix. The hymenium is even, but when examined under a good pocket lens is seen to be densely covered with minute colourless bristles, which are in reality the projecting points of the hymenial structures called cystidia. The presence of these projecting cystidia is practically the only distinction between the present genus and *Corticium*. To understand cystidia properly, a thin section of the hymenium should be examined under the microscope.

#### HYMENOCHÆTE

Forming dry, coriaceous patches, either entirely adnate or partly free and reflexed or bent away from the matrix. The hymenium, when examined with a pocket lens, appears to be minutely bristly, due to the presence of myriads of projecting cystidia. But in this instance the cystidia are coloured deep brown; whereas in *Peniophora* the cystidia are colourless. Microscopic examination will reveal other points of distinction between the cystidia of the two genera named. In *Peniophora* the cystidia are very thin-walled, and near the tip encrusted with particles of lime. In *Hymenochæte* the cystidia are very thick-walled, coloured, and smooth. The hymenium is usually dark rusty brown or orange-brown, the margin sometimes deep yellow or orange.

#### STEREUM

In the higher species the habit simulates that of the most perfect forms of *Thelephora*. The stem is central, supporting a more or less funnel-shaped cap, which is more or less lobed or incised at the



## PLATE XXXII

1. CRATERELLUS CORNUCOPIOIDES
2. CYPHELLA CAPULA
3. HYMENOPHYTE RUBIGINOSA
4. STEREOUM PURPUREUM
5. PENIOPHORA ROSEA
6. A SMALL ISOLATED SPECIMEN OF STEREOUM MULTI-  
ZONATUM
7. ALDRIDGEA SEBACEA
8. STEREOUM HIRSUTUM



PLATE XXXII.





edge. From this condition we pass through species spreading horizontally and attached by a broad base to the lowest type of structure, which is entirely resupinate. Whenever a free portion is present, the sterile side is always densely silky or velvety; the hymenium is constantly smooth and even, and does not become cracked when dry, as in the allied genus *Corticium*. In some species the substance of the hymenium becomes deep red when scratched or bruised.

#### CLADODERRIS

Cap leathery, with a central or lateral stem; hymenium with vague, radiating ridges which are often nodulose or warted. The only British species is a minute fungus, closely resembling a stunted form of *Stereum hirsutum*, differing in having a wrinkled hymenium.

#### THELEPHORA

In this genus we meet with considerable diversity of form and relative differentiation. Some species grow erect, with a central stem; others are partly adnate, with an upper, free, spreading portion; several lie more or less flat on the ground, and consist of several overlapping portions; while some of the lower forms are almost entirely adnate to the substratum. The texture is generally coarsely fibrous and very dry; the prevailing colour is dusky brown. The hymenium in several species shows a tendency to become uneven, being either irregularly papillose or warted, or furnished with more or less raised lines.

#### CYPHELLA

Minute fungi growing on herbaceous stems, dead wood, etc. The cap is usually more or less cup-shaped, with or without a short stem; often pendulous or hanging with the opening of the cup downwards. The hymenium is situated inside the cup.

#### SOLENTIA

Minute fungi, more or less cylindrical, with the mouth or opening somewhat contracted. Usually numerous specimens are closely crowded together, forming somewhat large patches on wood and bark. The hymenium is on the inside of the cylinder.

#### CRATERELLUS

All the species grow on the ground. Cap more or less funnel-shaped; sometimes this feature is very pronounced, and the opening continues down the stem, so that it is literally funnel-shaped. Substance usually quite thin and pliant. The hymenium is situated on the outside of the funnel-shaped portion, and is either even or slightly wrinkled; but there is never so strong an indication of gills, in the way of ridges, as is met with in some of the simpler



types of *Cantharellus*, which in other respects generally resemble species of *Craterellus*, and are often confounded by beginners.

### EXOBASIDIUM

The only truly parasitic genus in the Thelephoraceæ. Forming gall-like blisters on the leaves of various species of *Rhododendron*. It is a remarkable fact that all the known species of *Exobasidium* are parasitic on plants belonging to the order Ericaceæ.

### ALDRIDGEA

Resupinate, effused or vaguely spreading, subgelatinous when growing, cartilaginous or rigid and collapsed when dry ; hymenium smooth, even ; spores coloured.

Allied to the genus *Coniophora* in the coloured spores, but readily distinguished by the soft, gelatinous consistency when growing. *Soppittiella*, a genus differing from *Aldridgea* in having warted instead of smooth spores, is joined to the last-named genus in this work.

*A. gelatinosa*.—Broadly effused, rather fleshy, subgelatinous, pallid, becoming dry and collapsed and purple-brown, margin determinate.

On heaps of sawdust, chips, etc. Spreading for several inches, irregular in form.

*A. sebacea* (Pl. XXXII, fig. 7).—Fleshy, soft, then rigid, very variable in form, whitish at first, hymenium collapsing when dry and becoming tinged brown or cinnamon. Smell none.

Running up stumps, twigs, grass, etc., forming irregular, crust-like or stalactitic growths.

*A. fastidiosa*.—White, becoming cream-colour, forming shapeless, encrusting masses on various substances, hymenium more or less warted, becoming tinged brown. Smell strong.

Readily distinguished by the very foetid smell, especially when bruised.

On the ground, leaves, twigs, etc., running over everything in its path, forming a thin, irregularly branched film.

*A. cristata*.—Much resembling *A. fastidiosa* in habit, colour, and size, but readily distinguished by the entire absence of smell.

*A. cæsia*.—Effused, thin, soft, bright grey.

Forming large, thin, subgelatinous patches running over the ground, wood, moss, etc. ; looks like a thin *Corticium*, and more especially resembles *Peniophora Crosslandi*, but distinguished from both by its coloured spores.

*A. crustacea*.—Broadly encrusting, rather fleshy, hymenium irregularly warted, umber-brown, often with a purplish tinge, margin fibrillose, whitish.

Running over the ground, twigs, moss, etc. Distinguished by the dark colour of the hymenium and the white margin.

### CONIOPHORA

Broadly effused, thin, adnate, margin often indeterminate or imperfectly defined; hymenium smooth, powdered with the coloured spores at maturity.

The species form large patches on dead wood and bark. Substance very thin, and everywhere closely attached to the wood. The hymenium or uppermost exposed surface is perfectly smooth, that is, not furnished with minute hairs or cystidia, as in the allied genera *Hymenochæte* and *Peniophora*. Distinguished from *Corticium* by the coloured spores. Most of the species are of a dull yellowish brown colour with a paler, radiating, growing margin. The hymenium is often uneven, owing to its substance being so thin, and following the inequalities of the substance it is growing upon.

*C. olivacea*.—Thin, wide-spreading, dull yellowish olive, and glistening with minute particles of oxalate of lime, margin paler, becoming cracked.

On dead pine trunks, often widely effused, and covering nearly the whole of the surface of fallen trunks. Must be carefully distinguished from *Peniophora olivacea*, which has a minutely setulose or bristly surface.

*C. arida* (Pl. XXXIII, fig. 7).—Very thin, broadly effused, dingy sulphur-yellow, then ochraceous, finally brownish and powdery, margin, when growing, surrounded by a broad white or yellow-tinged zone of radiating mycelium.

*C. sulphurea*.—Broadly effused, rather thick, almost waxy, brownish yellow, margin bright sulphur-yellow, fibrillose, and running out in radiating, cord-like strands.

Running over bark, wood, leaves, etc. The hymenium is often sterile, and is then clear sulphur-yellow.

*C. subdealbata*.—Effused, thin, ochraceous olive, powdery, margin determinate or well defined.

Broadly effused on the inner side of bark.

*C. umbrina*.—Effused, soft and fleshy at first, tuberculose, contracting irregularly during drying, rusty umber, margin radiating villose, umber.

Encrusting wood, branches, twigs, etc., also growing on the ground.

*C. pulverulenta*.—Broadly effused, thin, rusty brown, powdery, margin thin, byssoid or radiating, whitish.

Distinguished by the rusty brown or dark brown, powdery hymenium and the whitish margin.

On dead wood.



*C. puteana*.—Broadly effused, thickish, separable as a film from the matrix, dingy yellow, becoming olive brown, margin byssoid, whitish.

Somewhat waxy when young, and can be peeled off as a tough sheet.

On wood and bark.

*C. incrustans*.—Effused, indeterminate, dirty white or pale ochraceous, powdery.

Running over twigs, leaves, etc., as a thin, whitish, inseparable film.

*C. ochracea*.—Very broadly effused, submembranaceous, usually indeterminate, hymenium pulverulent, whitish, then ochraceous.

Inseparable. In its most highly developed condition, somewhat resembling *C. sulphurea*, from which it is distinguished by its indeterminate margin and small, subglobose spores.

Spreading over the inner surface of bark, etc.

*C. cookeii*.—Effused, fibrilloso-membranaceous, edge byssoid, whitish; hymenium olive with a rusty tinge, even, pulverulent.

On rotting wood.

*C. membranacea*.—Forming broadly effused, roundish patches, thin and very brittle when mature, separable from the matrix, edge minutely fibrillose, yellowish; hymenium minutely pulverulent, pallid, then dingy pale ferruginous.

Forming patches often a foot or more in diameter, thin, becoming cracked and peeling off in patches when dry.

On wood, old walls, etc.

*C. pulverulenta*.—Broadly effused, edge thin, whitish; hymenium rusty brown, pulverulent, even, entire.

The rusty brown, or sometimes dark brown hymenium, white byssoid margin, and large spores stamp this species.

On dead wood.

*C. cinnamomea*.—Commencing as isolated patches, which soon grow into each other, and form a broad, irregularly effused patch, with a coarsely fibrillose margin; hymenium fleshy, dingy cinnamon, cracked when dry.

Fleshy and rather soft, becoming cracked during drying; sometimes dingy brown. Superficially resembling dark forms of *Peniophora velutina*, but distinguished by the coloured spores and the absence of cystidia.

On wood and bark.

*C. berkeleyi*.—Effused, determinate, thick; hymenium becoming much cracked, silky in the cracks, yellowish brown, assuming a purple tinge with age.

Very thick and compact for a *Coniophora*, hymenium becoming much cracked, due to contraction during drying. The margin is

sometimes minutely byssoid. Superficially resembling *Corticium lactescens*, but readily distinguished by the coloured spores.

On decorticated wood.

#### CORTICIUM

Forming closely adherent thin crusts on wood and bark; hymenium smooth and polished, becoming cracked when dry. Spores colourless.

Closely resembling species of *Peniophora* in habit and colour, but distinguished by the absence of minute bristles or cystidia projecting from the hymenium, which is consequently perfectly smooth or glabrous.

1. *Margin well defined, free, and often more or less upturned.*

*C. salicinum*.—Patches about 1 in. across, hymenium blood-red, margin raised, whitish and downy below.

On wood and bark of poplar, willow, etc.

*C. evolvens*.—Patches marginate, often effuso-reflexed, soft, whitish, and tomentose below; hymenium somewhat wrinkled, pale brown, then ochraceous or whitish, cracked when dry.

Often commencing as isolated round patches which sometimes become saucer-shaped and remain solitary; more frequently several grow into each other and form irregular patches with the margin more or less upraised, and fibrillose below; hymenium dingy ochraceous, sometimes with a lilac tinge, cracked when dry, and showing the fibrillose under layer or subiculum.

On bark, especially of rosaceous trees.

*C. porosum*.—Often effused for several inches, margin sometimes determinate and slightly raised, at other times almost indeterminate; hymenium, when well developed, waxy, even, pallid, with little scattered pits or depressions.

Colour of wash-leather; hymenium often sterile, and then spongy and porous. When dry often cracked into large pieces, gaping, the edges curling up. The pores suggest dewdrops having settled on the hymenium, which had, in consequence, retracted at those spots.

On wood and bark.

*C. populinum*.—Usually commencing as minute, silky patches that run into each other, and spread, margin incurved; hymenium uneven, greyish ferruginous, white and downy underneath.

Often springing from old *Sphæriæ*; distinguished amongst its allies by the ferruginous hymenium.

On poplar.

*C. lycii*.—Forming irregular patches of variable size; hymenium bright lilac.

Superficially resembling *Stereum purpureum*, which differs in the velvety, sterile surface.

On branches of *Lycium* and *Syringa*.



PLATE XXXIII

1. CORTICIUM LÆVE
2. STEREUM RUGOSUM
3. CORTICIUM CÆRULEUM
4. AURICULARIA MESENERICA
5. CORTICIUM COMEDENS
6. „ CALCEUM
7. CONIOPHORA ARIDA





PLATE XXXIII.





2. *Margin not free, indeterminate, byssoid or strigose.*

\* *Hymenium whitish or ochraceous.*

*C. calceum* (Pl. XXXIII, fig. 6).—Thin, broadly effused, hymenium smooth, polished, whitish, often tinged with ochre or lilac when dry, becoming cracked.

On wood and bark.

*C. fœtidum*.—Forming crust-like patches; hymenium whitish, then tinged ochre, very fœtid when fresh, if crushed.

Forming a crust on sawdust, etc.; hymenium irregular, due to following the inequalities of the matrix.

*C. lacteum*.—Broadly effused, thin, usually more or less wavy or broken up into lobes at the edge, whitish, tinged ochre or buff when dry. Cracking.

Forming irregular patches many inches in length, margin often giving off long frondose strands of mycelium.

On wood.

*C. sambuci*.—Broadly effused, thin, white.

On old elder trunks.

*C. lactescens*.—Broadly effused, rather thick, ochraceous or tinged dull red, giving out a white, watery milk when broken. Becoming much cracked when dry.

Distinguished by the white milk.

On oak, willow, etc.

*C. scutellare*.—Broadly effused, thin, inseparable from the matrix, margin indistinct, white, then dingy tan-colour or tawny; hymenium waxy, smooth, very much cracked in an areolate manner, silky and white in the cracks.

Recognized by the areolately cracked, tan-coloured hymenium.

On wood, herbaceous stems, etc.

*C. læve* (Pl. XXXIII, fig. 1).—Closely adnate, thin, edge radiating, but not fibrillose; hymenium hyaline, white when dry.

Often originating as small, roundish, scattered patches, which soon extend into each other. Closely attached to the matrix, thin.

On bark, especially beech.

*C. arachnoideum*.—Thin, effused, white or pallid, edge not determinate, fibrillose or subfloccose below, edge fimbriated with white fibrils; hymenium waxy, continuous, only becoming cracked when dry, pale ochraceous.

Forming delicate, spreading, cobweb-like patches, snow-white. This is the usual condition, and is sterile. When perfectly developed the hymenium becomes compact, often spreading for several inches, often with a tinge of glaucous green, pale ochraceous when dry, running off at the edge into the cobweb-like form.

On wood, bark, moss, etc.



*C. typhæ*.—Very thin, spreading in long lines, at first appearing as small, white, byssoid spots; hymenium at first smooth, then minutely mealy, and sometimes slightly cracked, edge sometimes indeterminate and mealy.

Forming small, elongated patches; hymenium dull buff when dry.  
On dead leaves of *Typha*, *Carex*, etc.

*C. lacunosum*.—Broadly effused, soft, mycelium cinnamon or dirty ochraceous, felty and lacunose; hymenium ochraceous or cinnamon, waxy and polished, not cracked when dry.

Spreading broadly, generally loosely fibrillose, spongy, with irregular holes or lacunæ on the surface. Sometimes forming a thick felt on wood, and spreading on to the ground, twigs, etc., with scattered tufts or patches of hymenium, as in *C. arachnoideum*. Sometimes changing gradually into a compact, continuous waxy hymenium, of an ochraceous or pale cinnamon-colour when dry.

On wood, bark, and spreading to the ground.

*C. radiosum*.—Forming thin, closely adnate, roundish patches, edge radiating, fibrillose, white; hymenium dingy ochraceous, not cracked when dry.

Somewhat resembling *C. lacteum*; differing in the dark ochraceous hymenium, which does not crack when dry.

On rotten wood.

\*\* *Hymenium brightly coloured*.

*C. sanguineum*.—Broadly effused, indeterminate, loosely attached, cottony underneath; hymenium pale red, then pale, radiating marginal strands blood-red.

On fallen branches and wood.

*C. roseolum*.—Very broadly effused and very thin; hymenium bright rose-colour, then pale.

Resembles *Peniophora incarnata*, but has no bristles in the hymenium.

On old worked wood.

*C. carlylei*.—Forming elongated, waxy-looking patches apparently sunk in the matrix; hymenium polished, dingy orange, margin whitish. Not cracking.

On dead branches.

*C. cæruleum* (Pl. XXXIII, fig. 3).—Broadly effused, hymenium deep bright blue with a satiny sheen, becoming pale, edge whitish.

Distinguished by the intensely deep clear blue colour. Phosphorescent in the dark, emitting a pale greenish yellow light.

On old wood, branches, etc.

*C. violaceo-lividum*.—Hymenium dingy reddish purple, usually more or less corrugated or warted, margin paler, patches 1–2 in. across.

On wood.

*C. aurora*.—Very thin, spreading, closely adnate, rosy, becoming pale, edge indeterminate.

Very thin, pink. Distinguished from *C. typhæ* by the large, pip-shaped spores, but scarcely by external characters.

On dead leaves of *Carex*, etc.

*C. anthochroum*.—Spreading widely, and forming thin, bright rose-colour or brick-red patches that become pale, edge byssoid, paler.

When perfectly evolved, the hymenium is waxy, and sometimes cracked when dry. Usually sterile and minutely velvety under a pocket lens.

On bark, etc.

*C. molle*.—Forming roundish patches of loose texture, soft, margin not byssoid; hymenium pallid, more or less spotted with red, waxy, more or less papillose or warty, cracked when dry.

Known by the thick, soft, fleshy substance.

*C. polygonium*.—Closely adnate, margin determinate, byssoid, soon becoming hard; hymenium pinkish, pruinose, usually much cracked.

Usually first appearing as small, detached tubercles, which generally grow into each other, and again separating when dry, thick, giving the patch a much cracked or tessellated appearance. Sometimes the patch is continuous, and then more or less tuberculose or warted, edge thin, adnate, byssoid; hymenium pruinose, pinkish, lilac or dingy ochraceous.

On bark, especially poplar, also on wood.

*C. flaveoleum*.—Broadly effused, very thin, loosely attached to the matrix, margin determinate; hymenium pale primrose-yellow.

Forming patches 2–3 in. across, suborbicular or variously lobed, clear but pale primrose-yellow.

On the trunk of a tree-fern. Perhaps an introduced species.

*C. lividum*.—Thin, spreading, closely adnate, waxy and soft, variously coloured, bluish grey, dingy purple, etc., margin similar; hymenium not pruinose, slightly viscid, cracked when dry.

Differs from *C. violaceo-lividum* in the hymenium not being pruinose and cracked when dry, and by the margin being coloured like the hymenium.

On dead wood, etc.

*C. atro-virens*.—Irregularly spreading, very thin, blackish green, the indeterminate edge tomentose, similarly coloured; hymenium, when perfectly developed, paler, glaucous, and waxy.

On rotten wood, leaves, sticks, etc.

3. *Growing under the bark, which is lifted up and pushed off.*

*C. comedens* (Pl. XXXIII, fig. 5).—Patches rather broadly effused, inseparable from the matrix, exposed by the rupture of the bark, dingy lilac, then becoming pale; hymenium even, smooth, cracked when dry.



Readily known by originating under the bark, which becomes cracked and curls back.

On branches, especially hazel.

*C. nigrescens*.—Hymenium yellowish, becoming almost black when exposed.

On branches, originating under the bark. Resembling *C. comedens* in habit, but distinguished by being pale at first, and then becoming blackish, whereas the last-named is purple when growing and becomes pale when exposed by the rupture of the bark. Effused, very thin, closely adnate, indeterminate; hymenium waxy, powdered with very large spores.

### PENIOPHORA

Resupinate fungi, entirely attached to the substance they are growing upon, or with the edge free and more or less upturned; hymenium even, bristling with minute colourless hairs or cystidia. Spores colourless.

■ All the species form more or less expanded crusts on wood or leaves. To the naked eye the hymenium appears to be perfectly smooth, but under a good pocket lens is seen to be bristling with numerous minute bristles. The genus *Corticium* differs in the absence of bristles in the hymenium.

#### 1. *Edge free, upturned.*

*P. quercina*.—Forming patches of a circular or elongated form, substance rather thick and cartilaginous, the edge becoming free and upturned, blackish underneath; hymenium reddish lilac, flesh-colour or often slate-colour when old.

On oak branches, rarely on other trees.

*P. pezizoides*.—Bursting through the bark, starting as a small cup-shaped body, gradually expanding. Much like *P. quercina*, differing in the pale, downy under side.

On dead branches of horse chestnut.

*P. gigantea*.—Broadly extended, rather fleshy, cartilaginous when dry; hymenium whitish, minutely velvety, margin free, more or less fibrous.

Often forming patches of irregular form a foot or more in extent, becoming tinged brown or lilac, and becoming smooth.

On wood and bark of fir, etc.

*P. crosslandi*.—Effused, thin, soft when moist; hymenium minutely setulose or hispid under a lens, grey, with a slight ochraceous tinge when dry; edge determinate, slightly raised, the whole fungus separable from the matrix when dry (cystidia numerous, conical,  $30-40 \times 10 \mu$  above the hymenial surface, colourless and studded with particles of lime; spores elliptical,  $6 \times 3 \mu$ ).

Resembling *P. gigantea* in being soft and fleshy when growing,

and cartilaginous and separable from the matrix when dry. Differs in the shorter cystidia and smaller spores.

On bark and wood of fir.

2. *Edge not free, often not well defined.*

*P. limitata*.—Irregularly circular in outline; hymenium dingy ochre, becoming pale, edge blackish.

On bark and wood.

*P. rosea* (Pl. XXXII, fig. 5).—Broadly effused, thin, resembling a coat of paint; hymenium clear rose-pink, edge whitish.

On wood and bark. Fading to a pale ochre when old and dry.

*P. incarnata*.—Broadly effused; hymenium reddish or orange, not becoming pale, edge byssoid.

Differs from *P. rosea* in not becoming pale when dry.

*P. ochracea*.—Broadly effused; hymenium ochraceous, sparkling with particles of oxalate of lime, margin radiating, cracked when dry.

Closely resembling *Coniophora olivacea*, but distinguished by the bristles projecting from the hymenium.

On bark and wood.

*P. cinerea*.—Commencing as small scattered patches, which soon run into each other and form large irregular patches, brownish grey, then greyish lilac.

On bark and wood, more especially ash.

*P. velutina*.—Broadly effused, margin running out into long, branching strands; hymenium cream-colour, distinctly but minutely velvety.

Hymenium often becoming tinged pink or buff.

On wood and bark.

*P. phyllophila*.—Thin, edge fibrillose, cream-colour.

On dead leaves. Much resembling *Corticium epiphyllum*, but distinguished by the bristly hymenium.

*P. terrestris*.—Very thin, indeterminate; hymenium pale grey or buff, minutely velvety.

Running over naked ground, twigs, leaves, etc.

*P. rimosa*.—Broadly effused, inseparable, edge indeterminate; hymenium ochraceous, cracked when dry, minutely velvety.

Very closely resembling cracked forms of *Peniophora velutina*, from which it differs in the larger spores, which measure  $15-17 \times 6 \mu$ ; whereas in *P. velutina* they measure about  $10 \times 5 \mu$ . The hymenium is usually cracked into numerous irregularly polygonal portions.

On bark and wood.

*P. scotica*.—Broadly effused, margin fibrillose, radiating; hymenium pale cinnamon, minutely velvety.

Closely related to *Peniophora velutina*, differing in colour and in the absence of the radiating marginal strands of mycelium.

Broadly effused over the inside of bark.



*P. pubera*.—Broadly effused, thin, indeterminate, inseparable; hymenium whitish or dirty pale buff, minutely velvety, cracked when dry.

Often very broadly effused, margin usually altogether indeterminate.

On bark and wood.

Sub-genus SCOPULOIDES. *Cystidia arranged in clusters*.

*P. hydroides*.—Broadly effused, indeterminate; hymenium grey, setulose.

Resembling several of the adnate species of *Hydnum* and *Grandinia* under a pocket lens; but on microscopic examination the spine-like projections are seen to consist of clusters of typical cystidia.

On bark.

#### HYMENOCHÆTE

Entirely resupinate or with the edge more or less free and reflexed, that is, bent over; hymenium minutely bristly or velvety, due to the presence of coloured bristles or cystidia.

Closely resembling *Peniophora* in habit and in the bristly hymenium; but in the present genus the bristles are coloured, and impart to the hymenium a rusty or brownish colour.

1. *Upper portion free and usually reflexed*.

*H. rubiginosa* (Pl. XXXII, fig. 3).—Effused, rigid, upper part reflexed, rusty brown, velvety; hymenium rusty, often with a tinge of purple, edge brighter coloured; spores colourless.

Sometimes altogether resupinate, at others a considerable portion is free and arched over; often imbricated, or many overlapping free portions are present; spores colourless.

On wood.

*H. tabacina*.—Thin, resupinate or the edge free and curved over, somewhat rusty; hymenium cinnamon or rusty with a purple tinge, margin golden yellow or orange; spores coloured.

Close to *H. rubiginosa*, but the spores in the present species are coloured.

On wood and bark. Often nearly covering old dead trunks.

*H. avellana*.—Coriaceous and hard. Edge obtuse, free, narrowly reflexed, reddish brown, velvety; hymenium minutely velvety, pale brown, readily becoming stained red when bruised; spores colourless.

Patches usually small, sometimes effused, edge free all round or reflexed above only; hymenium when dry dingy ferruginous, pruinose.

On hazel, beech, etc.

2. *Entirely resupinate*.

*H. leonina*.—Broadly effused; hymenium bright rusty orange, often with patches of clear yellow; spores colourless.

On dead wood, often spreading over the whole of a fallen log. Our brightest and finest species.

*H. corrugata*.—Broadly effused, thin, following closely the irregularities of the matrix, pale cinnamon, velvety; hymenium dark brown, rusty or cinnamon-colour. Cracked into polygonal areas when dry and old. Spores coloured.

Broadly effused, closely adnate and following the irregularities of the matrix; hymenium varying from dark brown, through ferruginous to cinnamon and dirty grey when dry. There is no tinge of purple present. Cracked into polygonal areas when dry.

On wood.

*H. croceo-ferruginea*.—Broadly effused, encrusting, very thin and closely adnate, varying from rusty orange to brownish; hymenium very minutely velvety, cracked when dry; spores coloured.

Margin sometimes byssoid, at others indeterminate; resembling *H. corrugata*, but differing in microscopic characters, viz. the very much swollen bases of the setæ and the subglobose spores.

On dead rose stems, etc.

*H. stevensoni*.—Rigid, edge blunt and thickened, or sometimes slightly raised; hymenium livid or greyish pink with a tinge of lilac when dry; spores colourless.

On yew. Patches about 1 in. across.

*H. fuliginosa*.—Effused, coriaceous, compact, obscure, smoky brown; hymenium even, densely setulose, thin, closely adnate to the matrix, margin very thin, yellowish rust-colour, often much broken up into patches and almost indeterminate; hymenium umber, with a rusty or purple tinge, appearing almost smooth under a lens, sometimes minutely cracked and brighter in colour; spores colourless.

On wood.

*H. nigrescens*.—Patches flattened, solitary or in groups, sometimes growing into each other, rigid, edge sometimes free and slightly turned up; hymenium setulose, brown, then blackish; spores colourless.

Subcircular, 1–2 in. across, adnate, but the edge often free and upturned, almost smooth and greyish below; commencing as circular patches which often grow into each other, often radially cracked through the entire substance; hymenium blackish umber, setulose.

On dry wood.

*H. crassa*.—Coriaceous, pale rufous, edge thickened and usually at length free from the matrix; hymenium unequal, velvety, rufous.

Patches from 1–2 in. across. Known by the more or less free, thickened margin and more especially by a microscopic character,



the subclavate setæ of the hymenium, often rough with particles of lime at the tip. In this last character approaching to the genus *Peniophora*.

On trunks.

#### STEREUM

With a central stem, or horizontal and fixed by a broad base, or forming a crust firmly fixed all over to the matrix or substance on which the fungus is growing. Cap fibrous or velvety; hymenium smooth, not becoming cracked; spores colourless.

Agrees with *Corticium* in the smooth hymenium; differing in the hymenium not becoming cracked when mature. *Peniophora* and *Hymenochæte* differ in the hymenium being minutely velvety or setulose (under a lens).

Growing on dead wood, stumps, etc. Dry, thin, pliant fungi. Very common.

\* *Stem central, growing erect.*

*S. sowerbyi*.—White. Pileus irregularly funnel-shaped, edge irregular, rough with projecting points; stem round, about  $\frac{1}{2}$  in. long.

On the ground, springing from buried twigs, etc.

*S. multizonatum* (Pl. XXXII, fig. 6).—Tough when fresh; pileus deeply funnel-shaped, variously cut and lobed, brownish flesh-colour with darker bands, passing into a short stem, 2–3 in. high.

As a rule, numerous pilei grow close together and run into each other, forming dense tufts 6–8 in. across and 2–3 in. high.

On the ground, springing from buried twigs, etc.

*S. tuberosum*.—White, becoming pallid or reddish, cut into narrow, irregular segments nearly or quite down to the tuberous base, the segments arranged in a funnel-shaped manner; stem, when present, slender; hymenium almost even.

Distinguished from *S. sowerbyi* by the pileus being cut into narrow segments nearly down to the base and arranged in an infundibuliform or funnel-shaped manner, and by the tuberous base of the stem, about 1 in. high.

On the ground.

*S. undulatum*.—Whitish, becoming tan-colour, depressed, minutely fibrillose, edge wavy; stem short, downy; hymenium minutely velvety, pale tan.

From  $\frac{1}{2}$ –1 in. high, depressed or funnel-shaped; stem short. Remarkable for the minutely velvety, buff hymenium.

On the ground.

*S. gausapatum*.—Densely tufted and grown together, sessile, fuscous, then paler, edge the same colour, entire; hymenium radiately rugulose, smooth, darker.

Pileus usually lacinate and spuriously zoned.

On trunks.

\*\* *Free portion horizontal, attached by a broad base.*

*S. hirsutum* (Pl. XXXII, fig. 8).—Pileus horizontal or partly attached to the matrix and partly free, or almost entirely adnate and hymenium upwards. Pileus coarsely fibrous, dingy ochraceous ; hymenium bright ochraceous tan, sometimes almost orange.

Very common on dead wood, posts, etc. The edge of the pileus is often very much fluted or puckered.

*S. purpureum* (Pl. XXXII, fig. 4).—General habit, size, and appearance of *S. hirsutum*, but the hymenium and edge of pileus pale clear purple when fresh, becoming dingy when old. The pileus has often a narrow dark zone near the margin when young.

On dead wood, also on living trunks and branches.

*S. spadiceum*.—Thin and tough, attached with more or less of the edge free ; hymenium brownish flesh-colour, becoming red when bruised.

Distinguished amongst the three species turning red when the hymenium is bruised or scratched, by the thin substance, and dark-coloured hymenium.

*S. sanguinolentum*.—Usually forming crowded, more or less circular, adnate patches, with more or less of a free margin, up to 1–2 in. across, thin ; pileus silky, pallid ; hymenium pale greyish brown, becoming instantly blood-red when scratched or bruised.

On wood and trunks, especially pine. The red stain when the hymenium is injured is much more intense and quicker in appearing than in either of the other species showing this character.

*S. rugosum* (Pl. XXXIII, fig. 2).—Adnate, edge sometimes partly free, rather thick and rigid ; pileus soon smooth, brownish ; hymenium pale yellow or greyish yellow, slowly becoming dull red when scratched or bruised.

Differs from *P. sanguinolentum* and *P. spadiceum* in the thicker, more rigid substance.

On dead wood ; also on living branches, especially those of cherry laurel, where it acts as a destructive parasite.

*S. ochroleucum*.—Spreading horizontally and fixed by a broad or narrow base ; there is often a broadly adnate portion, or the whole fungus may be adnate, leathery, rather thick, limp, silky, zoned, greyish white ; hymenium pale ochraceous, smooth, cracked, especially when dry.

All stages are met with, from fan-shaped to entirely resupinate. Pileus silky or strigose, becoming smooth when old.

On wood and bark.

*S. disciforme*.—Somewhat leathery, white, adnate, determinate, the thin edge free, naked, discoid ; hymenium rigid, uneven, pulverulent, pallid.

Forming subrotund patches  $\frac{1}{2}$ –1 in. across, very firm and rigid. On oak wood and bark.



*S. vorticolum*.—Coriaceous or leathery, effuso-reflexed, obscurely zoned, coarsely hirsute or hispid, margin similarly coloured; hymenium slightly rugulose, purple or lilac.

Intermediate between *S. hirsutum* and *S. purpureum*. Agreeing with the former in the coarsely strigose pileus, and with the latter in the colour of the hymenium; known from both by its thinner substance, which becomes torn when dry.

\*\*\* *Entirely adnate, edge scarcely or not at all free.*

*S. rufum*.—Somewhat cartilaginous, erumpent, or bursting through the bark, at first appearing as a wart or tubercle, then expanding and forming small circular patches; hymenium rufous, then brownish, powdered with a grey bloom.

Bursting through the bark in small round patches or warts, which gradually spread for some distance, retaining a more or less circular outline, extreme edge free or loose from the matrix. Looking like a *Corticium* in habit. Hymenium with small tubercles or warts, often arranged in irregular concentric circles.

On bark, usually of lime trees.

*S. frustulosum*.—Tuberculose, woody, crowded and almost running into each other, hence looking like one much cracked plant, under surface and margin smooth, brownish black; hymenium convex, cinnamon, pruinose, becoming pale.

Some conditions superficially resemble *Corticium polygonium*. Thick, tuberculose, the pieces close to each other. The patches are often cracked completely through, so that the whole presents a tessellated appearance. Hymenium usually cinnamon, becoming paler, but sometimes persistently brown.

On wood and bark.

*S. acerinum*.—Forming a thin, white, often broadly and irregularly effused crust, even, smooth.

Forming a thin, white crust, generally sterile, surface usually covered with minute particles of lime.

On living bark of *Acer campestre* and on fallen trunks of various trees.

*S. stratosum*.—Effused, clear pale ochraceous, smooth, here and there rugose or wrinkled, becoming yellowish.

On wood. An imperfectly known species.

#### CLADODERRIS

Cap with a central or lateral stem, or sessile; hymenium confined to one side, furnished with radiating ridges which are often nodulose or warted.

Texture dry. Resembling *Thelephora* in the hymenium, but differing in the elongated, colourless spores. Allied to *Stereum*; differing in the rugulose hymenium. Essentially a tropical genus; some of the species are quite large and somewhat fleshy, but dry.

*C. minima*.—Whitish, flabelliform or fan-shaped, resupinate, sterile, surface tomentose, 2–4 lines across (spores elliptic-oblong, apiculate at the base, curved,  $14-15 \times 4-5 \mu$ ).

Becoming yellowish tan when dry. Looking like a tiny, young specimen of *Stereum hirsutum*, distinguished by the wrinkled hymenium.

On bark. Gregarious.

#### THELEPHORA

Furnished with a central stem, or dimidiate or entirely resupinate, flaccid and fibrous in texture; hymenium generally wrinkled or irregularly warted.

All the species are more or less fibrous in texture and of a dingy brown colour.

1. *Growing erect, much cut up into narrow portions.*

*T. anthocephala*.—Entirely rusty brown, downy, broken up into erect, narrow segments with whitish fringed tips.

Forming tufts 1–2 in. high, segments usually narrowly wedge-shaped.

On the ground in woods.

*T. caryophyllea*.—Brownish purple; stem short, pileus irregularly cup-shaped, margin lobed or cut into narrow segments.

Tough, usually many plants closely crowded, forming dense tufts 2–3 in. high.

Among grass under trees.

*T. palmata*.—Brownish purple, broken up from the very short stem into many flattened, branched segments with whitish fringed tips. Very foetid.

Distinguished by the strong, unpleasant smell when rubbed. Forming dense tufts  $1\frac{1}{2}$ –3 in. high.

On the ground in woods.

*T. clavularis*.—Reddish brown with a vinous or purplish tinge, soft, branches very irregular, crowded, roundish or more or less flattened, smooth, pruinose, tips acute, whitish, downy; stem very short, somewhat tuberous.

Branches densely fasciculate, rounded or compressed, ending in more or less whitish, downy, acute tips, 1– $1\frac{1}{2}$  in. high.

*T. intybacea*.—Tufted, soft, whitish, then reddish brown; stems more or less confluent or grown together; pileoli overlapping, fibrous, edge expanded, whitish, becoming dark; hymenium papillose.

Variable in size, tufted,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. high, erect or with laterally spreading, sub-triangular pilei, 1–2 in. across.

On the ground.



2. *Pilei overlapping, growing horizontally.*

*T. terrestris*.—Brown, then blackish, many flattened, more or less circular, fibrillose overlapping parts ; hymenium radiately wrinkled.

Forming tufts 1–3 in. across.

On the ground in pine woods.

*T. laciniata*.—Brown with a tinge of purple, soft, coarsely fibrous in texture, encrusting, segments overgrowing each other, margin coarsely fibrillose, whitish ; hymenium rugulose and papillose.

Known from *T. terrestris* by the coarsely fibrous surface, shaggy margin, and papillose hymenium.

On the ground in fir woods, running up stumps, stems of heather, etc.

*T. biennis*.—Greyish brown or ochraceous, sometimes with a purple tinge ; pilei overlapping, tomentose, with a fringed, often upturned edge ; hymenium almost even.

Running over the ground, stones, wood, etc., and encrusting everything in its path. Known from *T. terrestris* by the even, not radiato-rugulose hymenium, and from *T. laciniata* by the tomentose, and not coarsely fibrillose pileus.

*T. mollissima*.—Whitish, becoming tinged brown, encrusting, very soft, either forming unbroken or continuous patches, or cut up into spreading, acute-pointed segments ; hymenium almost even, smooth, vinous brown.

Sometimes forming broadly effused, irregular, encrusting patches, without distinct pilei, at others erect and as much cut up as *Thelephora palmata*. Very soft.

On the ground, twigs, etc., in woods.

#### CYPHELLA

Very minute. Cup-shaped, erect or more frequently pendulous, stalkless or sessile, or with a short stem, outside downy or hairy, mouth or opening of the cup not contracted.

The most frequent forms are pendulous or hanging with the opening to the hymenium downwards, and resemble in miniature the head of an old-fashioned clay pipe with a very short piece of the stem attached. Some of the critical species cannot be satisfactorily determined without an examination of the spores, nevertheless a clear idea of the genus can be gained in the field, with the assistance of a good pocket lens.

1. *With a more or less distinct stem.*

*C. piii*.—Whitish or very pale yellow, cup-shaped, erect or pendulous, membranaceous, pubescent, margin of cup somewhat torn ; stem rather slender, crooked, enlarged near the cup or pileus.

Fasciculate ; about 2 lines high, cup about 1 line across. A somewhat showy species of the genus.

On dead herbaceous stems in water or in very damp places.

*C. cuticulosa*.—Membranaceous, white and diaphanous, at first oblong, then cup-shaped, smooth externally; the cup gradually elongating into a stem, 1–2 lines high.

On grass, etc. Gregarious.

*C. capula* (Pl. XXXII, fig. 2).—White or tinged primrose-yellow, membranaceous, obliquely bell-shaped, pendulous, almost smooth, margin wavy, stem short, thin, 2–3 lines long.

On stems of dead herbaceous plants. Crowded or scattered. Cups often more or less irregular in form.

*C. cernua*.—Is closely allied to *C. capula*, differing more especially in being altogether of a clear pale primrose-yellow colour; stem somewhat elongated.

On elder bark. Scattered or in small clusters. Sometimes nearly erect.

*C. lacera*.—Cup-shaped, membranaceous, pendulous, white or tinged yellow; stem short, soon becoming torn into shreds and covered outside with black fibrils. From 2–3 lines long.

On dead twigs.

2. *Cup sessile or subsessile*.

\* *Spores colourless*.

*C. galeata*.—Helmet-shaped, edge entire, almost sessile, whitish, tinged grey when moist; hymenium becoming brownish with age.

Snow-white at first, becoming dark cinnamon. Growing on mosses.

*C. muscigena*.—Very variable in shape, cup-shaped, spoon-shaped, etc., shining white, silky, stem short or absent, up to  $\frac{2}{3}$  in. across.

On living mosses.

*C. villosa*.—Sessile, white, hairy, cup-shaped; hymenium whitish, minute,  $\frac{1}{4}$ – $\frac{1}{2}$  line across.

Very minute, resembling a small hairy ball under a lens, when dry and contracted, expanded and cup-shaped when moist, and then resembling a minute *Peziza*.

On branches and stems of herbaceous plants.

*C. albo-violascens*.—Resembling *C. villosa* in size, but differing in having the hymenium tinged purple.

On wood, bark, twigs, etc.

*C. bloxami*.—Externally white, very thin, downy, edge irregularly lobed; hymenium pale, then light yellow.

On furze stems. Scattered and very minute.

*C. goldbachii*.—Whitish, thin, cup-shaped or cylindrical, sessile or substipitate, edge deeply and irregularly lobed, downy; hymenium even, pale.

Gregarious, 1–2 lines high, variable in form, sessile and cup-



shaped or cylindrical and furnished with a short stem; edge irregularly torn into segments.

On leaves, herbaceous stems, etc.

*C. catilla*.—Somewhat membranaceous, expanded, edge crisped and wavy; hymenium veined, grey.

Often imbricated, up to  $\frac{3}{4}$  in. broad. Allied to *Cyphella galeata*.

On moss, dead leaves, etc.

*C. fulva*.—Reddish cinnamon, sessile, globose, then becoming expanded or open, externally tomentose; hymenium same colour as the outside, even.

Scattered, or usually crowded in little clusters, about 1 line across, rough outside, with long, brown, aseptate (without septa), thick-walled, often curved hairs.

On dead bark, etc.

*C. brunnea*.—Dirty brown, sessile, cup-shaped, clothed near the margin with a grey bloom, margin incurved, lacerated or torn, mouth oblique; hymenium smooth, discoloured brown, flesh paler, subgelatinous.

On bark or wood of elder trees. Scattered or crowded, minute and liable to escape attention.

*C. stuppea*.—Erumpent, sessile, cup-shaped, coarsely hispid externally, brownish, becoming paler; hymenium persistently brown.

Erumpent or bursting through the bark, scattered, sessile on a broad base, rigid when dry. About  $\frac{1}{2}$  line across.

On brown stems.

*C. dochmiospora*.—White, sessile, cup-shaped, minutely downy.

Minute, snow-white. Distinguished amongst the other minute white species by the large, inequilateral spores.

On dead stems, etc.

*C. berkeleyi*.—Sessile, globose, then expanding and becoming campanulate, minutely pilose, reddish grey externally, as is also the hymenium.

Scattered,  $\frac{1}{2}$ –1 line across, distinct from *C. griseo-pallida* in being found on leaves, and not on wood and bark. It also differs in the spores.

On dead leaves of *Carex paniculata*.

*C. pallida*.—Cups at first orbicular, at length irregularly lobed, plane, tomentose or slightly hispid, sessile; hymenium at length wrinkled, pallid ochraceous.

Superficial,  $\frac{1}{4}$ –1 line across, sometimes proliferous or with smaller specimens growing from the hymenium or margin. Differs from *C. albo-violascens* in the ochraceous hymenium, and irregular shape.

On old stems of *Clematis vitalba*, etc.

\*\* *Spores coloured.*

*C. fraxinicola*.—Snow-white, cup-shaped, sessile, minutely downy; hymenium pale yellow, becoming darker.

To the naked eye appearing as very minute, snow-white cups. Not half a line across.

On ash bark. Scattered or gregarious.

*C. muscicola*.—Membranaceous, subsessile, cup-shaped, drooping or pendulous, minutely fibrillose, whitish, edge irregularly torn and wavy, downy; hymenium even.

About 2 lines across, whitish; the whole plant becoming dingy ochraceous when dry.

On mosses.

*C. ochroleuca*.—Very pale ochraceous, membranaceous, villose or downy, cup-shaped, the margin becoming lacerated or torn, sessile; hymenium ochraceous.

On dead bramble stems. Scattered. 1–1½ lines across.

#### SOLENIA

Minute fungi, more or less cylindrical in form, hollow, and with the mouth or opening at the top more or less contracted; usually downy or hairy externally.

Allied to the genus *Cyphella*, but differing in the narrowly cylindrical form and densely crowded habit, usually hundreds of the minute sporophores are closely packed side by side, resembling so many drain-pipes standing on end. This can only be observed under a pocket lens.

*S. maxima*.—Gregarious, but not very crowded, whitish or pale buff, downy, subcylindrical, base slightly narrowed, about 1 line high.

Forming patches ½ in. or more across. Our largest species.

On rotten wood.

*S. fasciculata*.—Usually forming crowded patches, cylindric-clavate, whitish, silky, ⅓–½ line high.

Distinguished by its white colour.

On dead wood.

*S. anomala*.—Usually densely crowded and forming large patches, pear-shaped, margin of mouth incurved, rusty or ochraceous, downy, about ⅓ line high.

Either forming small crowded patches, or quite continuous for several inches, when it superficially resembles a species of *Poria*.

On dead wood and bark.<sup>11</sup>

var. *ochracea*.—Differs from type in scattered habit, smaller size. Usually gregarious, but not densely packed.

On rotten wood, bark, etc.



## CRATERELLUS

Pileus deeply funnel-shaped, substance thin, pliant ; hymenium external, slightly wrinkled.

Superficially resembling some species of *Cantharellus*, but distinguished by the absence of distinct gills.

\* *Funnel-shaped ; hollow to the base of the stem.*

*C. cornucopioides* (Pl. XXXII, fig. 1).—Very deeply funnel-shaped, hollow to the base, thin, smoky black, minutely scaly inside, edge turned over and wavy ; hymenium grey, indistinctly wrinkled, 2–4 in. high.

On the ground in woods. Usually in dense clusters. Must be carefully distinguished from *Cantharellus cinereus*, which has more distinctly marked gills. In spite of its uninviting appearance, this is one of the best of edible fungi.

*C. lutescens*.—Deeply funnel-shaped, edge wavy, brown ; stem hollow, smooth, yellow ; hymenium yellow, with branching, slightly raised veins. Stem 1–3 in. long, pileus 1–4 in. across.

On the ground in woods. Smell quite strong, resembling spirits of wine. *Cantharellus tubæformis* is somewhat similar in appearance to the present species, but has distinct gill lines.

\*\* *Funnel-shaped ; stem stuffed.*

*C. sinuosus*.—Funnel-shaped, greyish brown, downy, edge wavy ; stem pale yellow, stuffed, up to 1 in. high ; hymenium greyish, with branching veins.

Smell strong, musky. Pileus  $\frac{1}{2}$ –1 in. high and broad.

\*\*\* *Irregularly top-shaped ; solid.*

*C. clavatus*.—Irregularly top-shaped, solid, pale dingy yellow ; hymenium almost even, dingy purple.

On the ground in woods. Pileus  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across.

## EXOBASIDIUM

Fungi parasitic on living plants, leaves more especially, which become deformed. The whole of the vegetative portion of the fungus is buried in the substance of the host, the fruit of the fungus appearing on the surface of the leaf as a delicate bloom.

*E. vaccinii*.—Forming variously shaped fleshy patches on the part attacked ; hymenium appearing on flesh-coloured patches on the under-surface of the leaves, which become covered with a white bloom.

On living leaves of *Vaccinium myrtillus*. Red or purple patches on the upper-surface of the leaves indicate the presence of the fungus. The parasite occurs on other species of *Vaccinium*, also on species of *Andromeda* and of *Acrostaphylos*, in various parts of Europe, and may yet be found on other hosts in this country.

*E. rhododendri*.—Forming gall-like, bullate excrescences on the leaves, which are at first of a pale, sickly green colour, gradually becoming reddish and shining, and finely covered with a delicate bloom due to the production of spores.

On leaves, less frequently on petioles and stems of *Rhododendron ferrugineum* and other species of *Rhododendron*. The galls or blisters vary in size from a pea to that of a marble.

#### CLAVARIACEÆ

Sporophore erect, simple and more or less club-shaped, or variously branched and forming dense tufts; hymenium usually covering the whole surface of the sporophore. Flesh somewhat brittle (not tough and leathery).

The family presents a great variety of form from a simple, typical, club-shaped body, through a slightly branched condition, up to forms that are densely branched and resemble trees or various corals in miniature.

Several widely separated fungi closely resemble members of the Clavariaceæ in general habit, more especially *Calocera viscosa*, a deep golden yellow, viscid fungus not uncommon on pine stumps. The black species of *Hypoxylon* also come under this category, but are distinguished by their colour and tough consistency. These fungi are figured.

#### ANALYSIS OF THE GENERA

Forming a dense, compact body of large size, having the surface covered with thin, anastomosing, plate-like lobes. Fleishy.

*Sparassis*.

Fairly large, erect, clubs simple, or the plant broken up into numerous branches and branchlets. Fleishy.

*Clavaria*.

Minute, simple, filiform throughout or slightly club-shaped; sometimes springing from a small sclerotium.

*Pistillaria*.

Small. Branches filiform, very numerous, forming a brush-like tuft, springing from a short, slender stem.

*Pterula*.

#### NOTES ON THE GENERA

##### SPARASSIS

The species rank amongst the largest of fungi, and are rare everywhere. I once found a fine specimen 9 in. in diameter, near Lyndhurst, in the New Forest. The stout, main branches spring from a thick, root-like base, and are often so crowded together that they appear to form a solid, fleshy mass, which becomes broken up at the surface into flattened, more or less contorted lobes, which grow into each other. The general colour is a dingy white when fresh. Its general appearance has been compared to the heart of a cabbage; it also closely resembles some of the laminated corals. It is excellent eating, and the discovery of a specimen is



hailed with delight by the mycologist who is addicted to eating as well as to studying fungi.

### CLAVARIA

Perhaps nowhere amongst the fungi can a greater variety of form and general appearance be met with than in the genus *Clavaria*, and perhaps in no other instance are the various forms met with in *Clavaria* repeated in other genera of fungi having no relationship with *Clavaria*, other than being fungi. Hence, at the commencement of the study, the student is confronted with difficulties which at first sight appear almost insurmountable, but which, fortunately, after a little experience, fade into insignificance. Many of the fungi mimicking *Clavaria* do not even belong to the Basidiomycetes, as *Geoglossum*, *Hypoxylon*, *Cordyceps*, etc.; these can, of course, most certainly be separated by a microscopic examination, when the numerous asci, with their contained spores, will at once indicate their position and affinities. Apart, however, from microscopic work, the presence of myriads of minute wart-like bodies on the clubs, corresponding to the openings through which the spores escape, which are easily seen under a pocket lens, indicate that the fungus is not a *Clavaria*. When the fungus mimicking a *Clavaria* belongs to the Basidiomycetes, a microscopic investigation is even more a necessity, as in the case of *Calocera*; but even here the viscidty and toughness of the fungus indicates that it is not a *Clavaria*, where the flesh is soft and generally brittle.

So far as form is concerned, some of the simpler forms justify the generic name, being simply and literally club-shaped without a trace of branching. From this primitive type we meet with species showing a tendency to branch; whereas in the most highly evolved forms the conception of a club is completely lost, and the plants resemble a densely branched tree in miniature.

Several of the species are edible; probably none are poisonous.

With one or two exceptions, the species grow on the ground, mostly in woods, although a few of the smaller kinds are met with amongst grass in pastures and lawns.

### PISTILLARIA

The genus, as defined in this book, includes what have previously been considered as two distinct genera, namely, *Typhula* and *Pistillaria*, the first-named being distinct owing to the fact that the species spring from a minute sclerotium. This point of distinction, however, cannot be accepted as of generic importance, even if it were constant, which is not the case. It is even doubtful whether *Pistillaria*, in the broader sense, is really generically distinct from *Clavaria*. There are no real structural points of distinction, and the only feature that can be indicated is a relative difference in size. All the species of *Pistillaria* are minute, several not

exceeding 2–3 lines in length, and in the few that attain to a length of 1 or 2 in. the stem and club are delicate and thread-like.

Most of the species grow on dead leaves or on dead herbaceous stems, etc., lying in damp situations. Two or three kinds have been described as parasitic on the stems of cereals, root of sugar-beet, etc.

#### PTERULA

The two British species belonging to this genus, both of which are rare, are small plants 1–2 in. high, of a whitish or straw-colour, and recognized at sight by the dense tuft of long, thread-like branches springing from a short stem-like base. Growing on dead wood, dead leaves, etc.

#### SPARASSIS

Forming a large, irregularly globose, fleshy mass, having its entire surface covered with flattened, variously contorted, plate-like portions growing into each other.

Amongst the largest of British fungi, and cannot be mistaken for any other genus.

*S. crispa*.—Forming an irregularly subglobose, fleshy mass varying from 6–18 in. in diameter, having the surface covered with flattened, tortuous lobes, the whole springing from a stout, rooting base, colour varying from whitish to pale ochraceous.

Brittle. Amongst the best of edible fungi.

Amongst heather in fir woods, etc.

A second species of *Sparassis* has been recorded as occurring in this country, but it is doubtful whether the specimen was in reality other than *Stereum*.

#### CLAVARIA

Sporophore erect, simple and more or less club-shaped, or variously, often very much divided into branches and branchlets; hymenium covering every part of the sporophore; spores hyaline, or more or less ochraceous.

Growing on the ground, rarely on wood, fleshy, usually brittle, often brightly coloured. Differing from *Pistillaria* mainly in point of size, the species included in the last-named genus being minute.

A. *Plants unbranched, isolated or in small groups (not tufted).*

\* *Plants white.*

*C. acuta*.—Solitary or in small groups, simple, erect, clavate, tip acute, pruinose, very fragile,  $\frac{1}{2}$ –1 $\frac{1}{2}$  in. high (spores colourless, subglobose, 7–8  $\mu$ ).

Distinguished from *C. vermicularis* by its scattered habit and large spores.

Among grass and on soil in plant pots, etc.



*C. rugosa* (Pl. XXXVIII, fig. 6).—Sporophore rather tough, white or pallid, thickened upwards, tip blunt, longitudinally wrinkled, simple or with one or more blunt branches, 2–4 in. high, up to  $\frac{1}{4}$  in. thick (spores subglobose, colourless, 8–10  $\mu$ ).

Distinguished by the distinct, irregular, longitudinal wrinkles. A variable species within certain limits, but readily recognized. Typically unbranched, sometimes with one or two short blunt branches, rarely considerably branched.

In woods. Common. Solitary or gregarious.

\*\* *Plants drab or greyish.*

*C. tenuipes*.—Hymenophore unbranched, rather broadly club-shaped and tapering into a slender stem, wrinkled, blunt, pale drab,  $\frac{2}{3}$ –1 in. high, up to  $\frac{1}{2}$  in. thick (spores colourless, subglobose,  $6 \times 4$ –5  $\mu$ ).

On bare, heathy ground, etc. Solitary or gregarious.

\*\*\* *Plants reddish or purple.*

*C. rosea*.—Hymenophore simple, fragile, from pale to deep rose-colour, often yellowish at the tip, 1–1 $\frac{1}{2}$  in. high.

Among grass, moss, etc. Generally in small groups.

*C. purpurea*.—Hymenophore unbranched, acute, becoming hollow and compressed, purple, sometimes tinged brown or red, 3–5 in. high.

Among grass. More or less in clusters. Rare.

*C. incarnata*.—Hymenophore cylindrical, tip obtuse, flesh-colour, pruinose,  $\frac{1}{2}$ –1 $\frac{1}{2}$  in. high.

Distinguished from *C. rosea* by the duller red colour.

On the ground. Rare.

\*\*\*\* *Plants yellow.*

*C. inæqualis* (Pl. XXXIV, fig. 3).—Hymenophore simple or rarely with 1–2 short branches, cylindrical or compressed, tip blunt or pointed, deep yellow to rich orange, flesh white, 1–2 $\frac{1}{2}$  in. high (spores colourless, subglobose, sharply warted, 5–6  $\mu$  diam.).

Often confused with *C. fusiformis*, from which it differs by its deeper colour, not growing in dense tufts, and globose, warted spores.

Among grass in woods, parks, lawns, etc. Common.

*C. luteoalba*.—Hymenophore slender, even, fragile, colour apricot to apricot-yellow, 1–1 $\frac{1}{2}$  in. high (spores colourless, smooth, ovoid,  $6$ – $7 \times 3$   $\mu$ ).

Tastes like tallow. Becomes pale buff when dry.

In short grass, mossy banks, etc., singly or in small groups. Rather rare.

*C. persimilis* (Pl. XXXIV, fig. 2).—Hymenophore small, slender, subcylindrical, fairly tough, orange-yellow to orange, becoming darker on drying, 1–1 $\frac{1}{2}$  in. high (spores colourless, smooth, guttulate, subglobose to oblong, with a conspicuous oblique apiculus,  $5$ – $6 \times 4$   $\mu$ ).

In short grass on lawns, downs, etc. Rather rare.

*C. luteoalba* and *C. persimilis* are usually mistaken for forms of *C. inæqualis*. The latter may be distinguished from these by its fairly large size, deep yellow colour, which remains practically unchanged when dry, and, above all, by its warted spores. The much smaller *C. luteoalba* is known by its apricot colour, which turns pale buff on drying, and by its smooth, ovoid spores. The equally small *C. persimilis* is distinct in its orange hue, which deepens on drying, and in its subglobose, apiculate spores.

*C. argillacea*.—Hymenophore simple, fragile, club-shaped or cylindrical, tip usually blunt, greenish yellow; stem yellowish,  $\frac{2}{3}$ – $1\frac{1}{2}$  in. high (spores colourless, elliptical,  $7-9 \times 5-6 \mu$ ).

Easily distinguished by its blunt clubs of a pale greenish yellow colour and the elliptical spores.

In heathy places. Rather rare.

\*\*\*\*\* *Plants yellowish brown, usually tough.*

*C. pistillaris* (Pl. XXXIV, fig. 6).—Hymenophore simple, clavate or obovate, minutely velvety, whitish, then dingy yellow, finally dusky brown, size variable, 4–12 in. high, 1–2 in. thick at the widest part (spores white, elliptic-oblong,  $12-16 \times 7-8 \mu$ ).

Either club-shaped and tapering to a narrow base, or sometimes broadly elliptical or irregularly subglobose; flesh whitish, stuffed in the centre, that is, texture loose and cottony.

On the ground in woods. Not uncommon, but very sporadic in its appearance.

*C. ligula* (Pl. XXXIV, fig. 7).—Hymenophore clavate, much narrowed downwards, base downy, ochraceous with a rufescent tinge, tip blunt, 2–4 in. high, up to  $\frac{1}{2}$  in. thick above (spores colourless, elliptical,  $11-13 \times 4-5 \mu$ ).

Smaller and not so dark-coloured as *C. pistillaris*; also differing in the white downy base.

Attached by down to leaves, twigs, etc.

*C. fistulosa*.—Hymenophore slender, narrowly clavate, soon hollow, pale yellow, then rusty, 2–3 in. high, 1–3 lines thick at the tip (spores colourless, elliptical,  $14-15 \times 6-7 \mu$ ).

Attached by the downy root to twigs, etc.

*C. juncea*.—Hymenophore very slender, weak, wavy, tip acute, soon hollow, pale dingy yellow, then tinged rusty, the long, creeping stem downy (spores colourless, elliptical,  $10-12 \times 5 \mu$ ).

On dead fallen leaves, twigs, etc. Gregarious.

B. *Plants unbranched, tufted, clubs crowded together at the base.*

\* *Plants white.*

*C. vermicularis*.—Hymenophores densely tufted, white, cylindrical, tips acute, usually straight, about 2 in. high (spores colourless, elliptical,  $4 \times 3 \mu$ ).



## PLATE XXXIV

- |    |   |                  |
|----|---|------------------|
| 1. |   | CLAVARIA FORMOSA |
| 2. | „ | PERSIMILIS       |
| 3. | „ | INÆQUALIS        |
| 4. | „ | FUSIFORMIS       |
| 5. | „ | CINEREA          |
| 6. | „ | PISTILLARIS      |
| 7. | „ | LIGULA           |
| 8. | „ | AUREA            |



PLATE XXXIV.





Densely crowded in compact tufts. Said by an old author to resemble a bunch of candles (dips).

Edible, with an excellent flavour resembling "cheese straws."

Among short grass. Not uncommon.

\*\* *Plants yellow.*

*C. fusiformis* (Pl. XXXIV, fig. 4).—Hymenophores densely tufted, elongated, spindle-shaped, tips acute, simple or rarely somewhat branched, clear lemon-yellow, 2–3 in. high (spores colourless, globose, 5–6  $\mu$  diam.).

Known amongst the yellow species by its densely tufted habit of growth and clear lemon-yellow colour. Taste bitter. Often becoming hollow and compressed.

On the ground in woods, etc.

\*\*\* *Plants grey.*

*C. fumosa*.—Tufted. Hymenophore straight or slightly wavy, fragile, soon hollow, tips usually pointed and often curved, smoky brown or dusky ochre with a grey tinge, 2–3 in. high (spores colourless, elliptical, 6–8  $\times$  4  $\mu$ ).

On the ground among grass.

*C. Plants branched.*

\* *Plants white.* (*C. rugosa*, placed under A section, is sometimes branched.)

*C. cristata*.—Hymenophore with a short, stout stem which divides into numerous irregular branches that become flattened upwards, and divided at the tip into sharp-pointed branchlets; axils rounded, entirely white or with a tinge of cream-colour (spores pale ochraceous, subglobose, apiculate, 10  $\times$  8  $\mu$ ).

Forming tufts 1–3 in. high, known by the flattened branches being divided into several pointed branchlets resembling a stag's horn.

On the ground in woods. Not uncommon.

*C. kunzei*.—Hymenophore rather fragile, very much branched from the base, branches long, frequently forked and of about equal height; axils compressed, white or creamy white, 1–2 in. high (spores white, globose, 4  $\mu$  diam.).

Distinguished amongst white species by the numerous erect, repeatedly forked branches and very small spores.

In woods. Rare.

\*\* *Plants grey.*

*C. cinerea* (Pl. XXXIV, fig. 5).—Hymenophore with a short, thickish white stem which usually divides into numerous irregular grey branches that are often compressed and wrinkled, 1–3 in. high (spores subglobose, colourless, 7–9  $\mu$  diam.).

Very variable both in shape and depth of colour. Plants gregarious or often crowded and forming extended patches. Branches numerous and irregular, with only a few short branchlets, or flat-



tened and cut at the tip into several slender, pointed branchlets. Distinguished by the grey colour. Edible and, to my taste, one of the best as regards flavour.

On the ground in woods, etc.

*C. gigaspora*.—Hymenophore small, branching irregularly, sometimes almost palmate, branches erect, solid, cylindrical or flattened, tips blunt; stem not distinct, greyish with a yellowish tinge, rather tough (spores colourless, smooth, broadly elliptical, large, 12–16  $\times$  8  $\mu$ ).

Differs from *C. cinerea*, small forms of which it resembles, in the much larger spores.

Among moss in heathy places. Rare.

\*\*\* *Plants violet.*

*C. amethystina*.—Hymenophore much branched, branches round, even, tips blunt, violet, 1–3 in. high (spores subglobose, 5–7  $\mu$  diam.).

Usually much branched, but sometimes almost simple. Known by the violet colour.

Among grass in woods and pastures.

*C. conchylata*.—Hymenophore minute, very slender, at first simple with the tip toothed, then dichotomously branched, violet, becoming paler; stem reddish yellow, mycelium filamentous, white, about  $\frac{1}{3}$  in. high (spores colourless, globose, 2.5–3  $\mu$  diam.).

Recognized by the brilliant violet colour of the branches.

On naked ground under hazel. Gregarious. Rare.

\*\*\*\* *Plants reddish, yellow or rosy.*

*C. formosa* (Pl. XXXIV, fig. 1).—Hymenophore with a stout, fleshy, elastic, stem-like base which divides into numerous crowded, erect branches that become thinner upwards and divide at the top into several thin, erect, simple or toothed branchlets; stem and main branches pale ochraceous with a tinge of red; terminal branchlets yellow, 3–4 in. high (spores colourless, elliptical, 12–15  $\times$  4–5  $\mu$ ).

Plants often crowded and forming patches extending for several feet. Basal portion of stem sometimes whitish.

On the ground in woods.

*C. botrytes*.—Hymenophore with a thick, fleshy basal portion, giving origin to numerous crowded, thick, irregular branches which are thickened at the tips and broken up into numerous densely crowded, reddish, toothed branchlets, the larger branches and flesh white; tuft 3–6 in. across, 3–4 in. high (spores colourless, elliptical, 12–14  $\times$  5–6  $\mu$ ).

The ultimate branchlets vary in colour from clear rose to dingy red. Looks like the heart of a cauliflower.

On the ground in woods. Rare.

\*\*\*\*\* *Plants yellow or brownish yellow.*

† *Spores colourless.*

*C. muscoides*.—Hymenophore with a short, slender stem, downy at the base, branches slender, 2–3 times forked, axils rounded, branchlets thin, clear egg-yellow (spores colourless, subglobose, 5–6  $\mu$  diam.).

Forming a small tuft 1–1½ in. high. Distinguished by the clear egg-yellow colour.

Among grass in pastures. Common.

var. *fastigiata*.—Tufts very much branched, branches crowded, of equal length and forming a level top, rather tough. Colour of the typical form.

Among grass in pastures. Common.

*C. umbrinella*.—Hymenophore sparingly branched, branches and branchlets cylindrical, tips blunt, forked; axils usually rounded, entirely pale umber (spores pip-shaped, colourless, 5–6  $\times$  3–4  $\mu$ ).

Tufts  $\frac{2}{3}$ –1 in. high; stem sometimes rather thick and minutely velvety. Resembles *C. muscoides*, var. *fastigiata*, but distinguished by the brown colour and the pip-shaped spores.

On the ground.

†† *Spores ochraceous.*

*C. aurea* (Pl. XXXIV, fig. 8).—Hymenophore with a stout, fleshy, elastic trunk which divides into numerous thick branches that divide repeatedly in a forked manner and terminate in rather slender, erect, round branchlets, deep dull yellow above, lower portions pale, 3–4 in. high (spores pale ochraceous, elliptical, wall rough, 10–11  $\times$  5–6  $\mu$ ).

Forming large showy tufts. Flesh white.

On the ground in woods.

*C. abietina*.—Hymenophore much branched; stem short, thick, whitish, downy; branches slender, crowded, frequently divided, erect, deep dull ochraceous, becoming greenish when bruised, from 1–3 in. high (spores ochraceous, elliptical, 6  $\times$  3–4  $\mu$ ).

Plant very much branched from a stout base; branches sometimes rather thick, equal, repeatedly divided; axils rounded, tips abrupt and with several small points, at other times divided into numerous thin, erect branches, the whole plant resembling a birch besom. Taste bitter. Branches longitudinally wrinkled when dry.

On the ground in fir woods.

*C. flaccida*.—Hymenophore very much branched; stem short; branches crowded, repeatedly forked; upper axils rounded, the pointed terminal branches usually forcipate or curving inwards towards each other, entirely ochraceous (spores ochraceous, broadly elliptical, 4–5  $\times$  3  $\mu$ ).

Superficially resembling *C. abietina*, but the whole fungus is more flaccid and does not turn green when bruised. Stem some-



times  $\frac{2}{3}$  in. long, at others almost obsolete, from 1-2 in. high; mycelium whitish, creeping over leaves.

Amongst moss and leaves in woods.

*C. stricta*.—Hymenophore numerously branched; stem distinct, short; branches straight, crowded together, tips acute, about 2 in. high, pale dull yellow (spores ochraceous, elliptical,  $6-8 \times 4-5 \mu$ ).

Densely branched, branches crowded, repeatedly forking, tips usually with 2-3 pointed branchlets. The branches are more or less parallel to each other and form compact fascicle. White, cord-like mycelium is a characteristic feature of this species. Often densely covered with fallen spores near the base.

On logs, buried wood, etc. Not uncommon.

### PISTILLARIA

Hymenophore more or less clavate or cylindrical, the spore-bearing portion more or less differentiated from the stem. In some instances producing a sclerotium.

*Pistillaria*, as defined above, includes the genus known as *Typhula*, which has been considered distinct on the strength of the plants springing from a small sclerotium. This separation has never been suggested in the case of other genera, as *Coprinus*, *Collybia*, etc., where some of the species produce sclerotia. Again, it is doubtful as to whether *Pistillaria*, as here understood, should not be merged into *Clavaria*; the only distinction is one of relative size only, all the species of *Pistillaria* varying from minute to very minute.

*P. erythropoda*.—Hymenophore simple, springing from a more or less flattened, wrinkled, blackish sclerotium; stem  $\frac{1}{2}$ -1 in. long, very slender, dark red, club  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, cylindrical, white (spores  $5-6 \times 2-2.5 \mu$ ).

Sclerotium sometimes absent. White, fertile portion not much, if at all, thicker than the stem.

On dead herbaceous stems.

*P. phacorrhiza*.—Hymenophore simple, slender, springing from a brownish, compressed sclerotium, smooth, brownish, often wavy below, pale above (spores  $8-9 \times 4-5 \mu$ ).

Stem sometimes minutely velvety at the base. Fertile portion not at all thickened. Plant 1-3 in. high.

On dead leaves, herbaceous stems, etc.

*P. incarnata*.—Hymenophore cylindric-clavate, tip blunt, springing from a compressed, brownish sclerotium, whitish, tinged pink above, 1-2 in. high (spores subglobose,  $4 \times 5 \mu$ ).

Plant slightly and gradually thickened upwards, tip blunt, rarely forked. Distinguished from *P. phacorrhiza* more especially by the spores.

On dead herbaceous stems, etc.

*P. gyrans*.—Hymenophore with a slender, thread-like stem which is often wavy, downy ; club cylindrical and subovate, thicker than the stem, white, springing from a small brownish sclerotium (spores subglobose,  $5-6\ \mu$  diam.).

Entire plant  $\frac{1}{2}-\frac{3}{4}$  in. high ; stem very thin, straight or variously wavy or gyrose.

On dead leaves, stems of grasses, etc.

var. *grevillei*.—White, unbranched ; club thickened, tip blunt ; stem hair-like, downy, not springing from a sclerotium.

On dead leaves.

*P. muscicola*.—Hymenophore with a thin base, and gradually thickening into a cylindrical club with a blunt tip, white, 2-3 in. high, up to 2 lines thick (spores  $5-6 \times 3\ \mu$ ).

On living mosses.

*P. filiformis*.—Hymenophore with a slender, more or less branched, decumbent, brown stem ; clubs subcylindrical, rather thicker than the stem, whitish, 1-2 in. high (spores subglobose,  $4-5\ \mu$  diam.).

Among dead leaves.

*P. gracilis*.—Hymenophore minute, 1-3 lines high ; stem short, distinct, smooth or minutely hispid ; club pallid, tip somewhat acute, simple or forked (spores elliptical,  $6-7 \times 4\ \mu$  ; cystidia numerous, large, somewhat acute at the tip).

Tip of club often quite sharp-pointed.

On rotten, damp leaves, etc.

*P. pusilla*.—Hymenophore very minute, about 1 line high, slender, smooth, white (spores colourless, elliptical,  $5 \times 3\ \mu$ ).

On dead *Equisetum*, fallen leaves, etc.

*P. micans*.—Hymenophore very minute, about 1 line high ; stem short, whitish ; club with a blunt tip, club-shaped, rosy and shining (spores colourless, elliptical,  $8-10 \times 4-6\ \mu$ ).

Scattered or gregarious, about a line high ; distinguished by the rose-coloured, pruinose head.

On dead thistles, etc. Not uncommon.

*P. culmigena*.—Hymenophore whitish, hyaline, ovate, tip blunt ; stem distinct, very short, altogether 1-2 lines high (spores colourless, elliptical,  $4 \times 2-2.5\ \mu$ ).

Scattered ; very minute. Cartilaginous when dry.

On grass stems, etc.

*P. quisquilaris* (Pl. XXIV, fig. 5).—Hymenophore whitish ; stem thin, springing from a minute sclerotium ; head club-shaped, often compressed, sometimes forked (spores cylindric-oblong, curved,  $13-15 \times 6-7\ \mu$ ).

Soft when fresh, rigid when dry. Resembling *Clavaria uncialis* in general appearance, but markedly different in the large, sausage-shaped spores.

On dead fern stems, leaves, etc. Gregarious,



*P. furcata*.—Hymenophore white or yellowish, waxy, then tough, compressed and broad at the tip, narrowed downwards, generally forked, 1–1 $\frac{1}{4}$  in. high.

On soil in greenhouses. Generally tufted.

*P. puberula*.—Hymenophore white, minute, about 1 line high, obovate; stem distinct, pellucid, downy (spores colourless, elliptical,  $5 \times 3 \mu$ ).

On dead bracken, etc. Scattered.

*P. purpurea*.—Hymenophore purple, minute, about 1 line high, obovate, stem whitish (spores  $4 \times 3$ ).

Not previously described. Known by the purple club.

On damp, rotten leaves.

### PTERULA

Hymenophore very densely branched, branches very slender, substance somewhat cartilaginous, especially when dry.

The two British species form dense tufts composed of equal, thread-like branches. Distinguished amongst the Clavariaceæ by their cartilaginous consistency.

*P. subulata*.—Hymenophore densely branched, branches very slender, equal, not much divided below, breaking up at the tips into several finely pointed branchlets, greyish white, then pale amber (spores elliptical,  $8-10 \times 6-7 \mu$ ).

Forming dense tufts, 1–2 in. high, consisting of very numerous, subequal branches as thin as thread, becoming rather horny when dry. The branches are frequently connected by cross portions, or anastomose irregularly.

*P. multifida*.—Hymenophore densely branched, branches thin, almost equal, much divided, and ending in sharp-pointed tips, springing from a slender, more or less elongated, stem-like base, rather tough, whitish, becoming pale amber and cartilaginous when dry (spores elliptical,  $10 \times 6-7 \mu$ ).

Plants 1–2 in. high, usually clustered, several plants forming a dense tuft. Consisting of densely crowded, ascending branches, much divided and as thin as thread; base sometimes thick, at others consisting of several thin stems more or less grown together.

On dead leaves, branches, etc.

### TREMELLINACEÆ

The more or less gelatinous consistency is the most marked feature of the members of this group of fungi. In the genus *Tremella*, which is the type of the family, the substance is in some species so tender and deliquescent as to lose its form and almost slip through the fingers when handled. In other genera, as *Calocera* and *Auricularia*, the substance is still somewhat gelatinous and viscid when growing, but yet firm enough to retain its form. In

every instance the fungus loses a large quantity of water, and shrinks very considerably during drying, becoming rigid and horny when quite dry, but in most instances regains much of its original form and consistency when soaked in water.

As in every other group of fungi, there is a marked difference in general structure and differentiation between the most primitive and the most highly organized genera included in the group. Taking *Dacryomyces* and *Tremella* as representing the simplest types, we find that the whole of the portion commonly considered as representing the entire fungus, consists of hymenium or spore-bearing surface, pointing upwards and not in any way protected. In *Dacryomyces* the mass is practically even, whereas in *Tremella* the mass is broken up into numerous plates or folds, thus furnishing a much larger area or spore-producing surface. In *Calocera* the differentiation of the structure is advanced another step by the assumption of an erect, branching habit, by which the spore-bearing portion of the fungus is elevated well above the substance upon which it is growing, thus affording greater facilities for the distribution of its spores by wind or other agents. The highest type of structure, that is, the modification of an amorphous mass of fungus flesh, as seen in the genus *Dacromyces*, is met with in *Tremellodon*, where the differentiation into a fertile and a sterile portion is complete. The spore-bearing surface or hymenium is confined to the under-surface of the fungus, by which means it is protected from rain, dust, etc., and is furthermore crowded with spines on which the spores are borne, thus providing a much larger area or spore-producing surface than as if it had been even or more or less wrinkled.

Owing to the absence of sugar in the tissues, members of the Tremellineæ are not attacked by the larvæ of insects in the field, consequently, when collected for preservation they should simply be allowed to shrink until they are perfectly dry and rigid.

#### KEY TO THE GENERA

Broadly attached to the matrix, with the upper part free and reflexed; hymenium with raised ribs anastomosing to form an irregular network.

Substance subgelatinous.

*Auricularia.*

Substance cartilaginous and flexible, ear-shaped, attached by a narrow base.

*Hirneola.*

Cup-shaped, or forming irregular masses, very soft and gelatinous.

*Exidia.*

Forming brain-like or foliaceous sessile tufts, often quite large.

*Tremella.*

Firm, convex, and more or less plicate, with a central hard, white core.

*Næmatelia.*



Very soft and tremellose, bearing crowded, acute spines on the under surface. *Tremellodon.*

Forming small orange or yellow gelatinous warts on dead wood. *Dacryomyces.*

Erect, simple or branched, orange or rusty orange. Rigid when dry. *Calocera.*

Forming small, subgelatinous warts. (Can only be determined by microscopic examination, as given under the generic diagnosis.) *Dacryopsis.*

Forming small, gelatinous, yellowish warts, running down into a white rooting base. *Ditiola.*

Subglobose, inflated, hollow. *Apyrenium.*

Erect, more or less spoon-shaped, or irregular, colour deep red. *Gyrocephalus.*

More or less saucer-shaped and attached obliquely to the stem. *Guepinia.*

Cap saucer-shaped, attached to a central stem. *Femsjonsia.*

#### NOTES ON THE GENERA

##### AURICULARIA

The general consistency of these fungi is soft and subgelatinous when moist, becoming hard and rigid when dry, and reviving again when moistened. Substance thin, a considerable portion being attached to the wood on which it is growing, the upper portion becoming free, and standing more or less at right-angles to the matrix. The upper or sterile portion of the free portion is more or less hairy or velvety, the under surface lurid flesh-colour, and traversed by raised ribs or folds, which break up the surface into irregular pits or depressions.

##### HIRNEOLA

The only British species included in this genus, commonly known as the Jew's-ear fungus, met with only on old elder-trees, is more or less human ear-shaped, or shallowly cup-shaped, thin, and is somewhat subgelatinous when moist, or feels pliant, like a sheet of india-rubber. The outside is greyish and very minutely velvety or downy; the inside is polished and shining, more or less wrinkled like the inside of a human ear, and of a dark, dingy flesh-colour. This species is in all probability edible, although I am not aware of its having been tested, but a very closely allied species, *H. polytrichi*, not uncommon in tropical and subtropical countries, is esteemed as a dainty by the Chinese, and its collection and exportation to that country from New Zealand adds to the revenue of the last-named country. It is one of the species of fungi cultivated in China.

##### EXIDIA

The species included in this genus grow on wood, and form com-

paratively shapeless masses of a decidedly soft and gelatinous consistency. The commonest species, known as "witches' butter," is black, forming quaky masses often 1 in. long, the upper surface is covered with minute warts. A second equally common species occurs on fallen, rotten branches, under the form of pure white, nodulose lumps oozing out of the wood.

#### TREMELLA

The species grow on wood, and form gelatinous, tremelloid, soft masses, which are sometimes very much puckered or plaited, others form brain-like masses, as in *T. mesenterica*, a bright orange, gelatinous fungus common on rotten branches, stumps, etc.

#### TREMELLODON

A very gelatinous fungus, having spines on the under surface of the cap as in *Hydnum*. The basidia are peculiar in structure.

#### DACRYOMYCES

The species resemble small warts of orange jelly, 1-2 lines across. Common on old pine boards, posts, etc., in rainy weather.

#### NÆMATELIA

Forming small, gelatinous, whitish, puckered masses, distinguished by the presence of a small, hard, white, central nucleus or core.

#### CALOCERA

Erect, slender, simple or branched, resembling species of *Clavaria*, but distinguished by growing on wood, and by their gelatinous substance when moist, becoming rigid when dry.

#### DACRYOPSIS

Forming small, gelatinous warts, that can only be distinguished from allied genera by microscopic examination. The peculiar feature of the genus consists in the hymenium bearing a crop of conidia, previous to the formation of true spores borne on basidia.

#### DITIOLA

Resembling *Dacryopsis* in every point, except that conidia have not been observed.

#### APYRENIUM

Small, hollow, bladdery, subglobose, pale yellow structures, which collapse when old.

#### GYROCEPHALUS

Our single species, which is very rare, grows erect, flattened, and more or less spoon-bowl shaped, tapering downwards into a stem.

Colour deep red or reddish orange.



## GUEPINIA

Cap more or less saucer-shaped, gelatinous, attached obliquely to a stem that is paler in colour than the orange hymenium.

## FEMSJONSIA

Hymenium more or less saucer-shaped, with a central gelatinous layer, yellow, tapering downwards into a central, whitish stem.

## AURICULARIA

Inflated and gelatinous when moist, rigid when dry. Attached by a broad surface, upper part free and reflexed; hymenium variously broken up into pits by a raised network of folds.

*A. mesenterica* (Pl. XXXIII, fig. 4).—Reflexed above, velvety and zoned, brownish grey, edge not lobed; hymenium brownish purple or flesh-colour, much wrinkled with raised ribs.

Often covering a large surface, and with numerous overlapping free portions.

On trunks and logs.

*A. lobata*.—Differs from the preceding in having the edge of the pileus cut into irregular lobes.

On trunks.

## HIRNEOLA

Soft and subgelatinous when moist, irregularly saucer-shaped with wrinkled veins, barren surface minutely velvety; hymenium polished.

*H. auricula-judæ* (Pl. XXXVIII, fig. 4) (Jews' ears).—Thin and elastic when moist, rigid when dry; pileus greyish olive, minutely velvety; hymenium with irregularly arranged raised veins, brownish flesh-colour, 1–2 in. across.

Usually in small clusters, on old elder trunks.

## EXIDIA

Soft and gelatinous, without a very definite form; hymenium sometimes minutely warted.

*E. glandulosa* (Pl. XXX, fig. 9) (witches' butter).—Forming a thick, flattened body 1–2 in. across. Greyish and slightly downy on one side, dark brown, wrinkled and minutely warted on the under surface, the whole plant soon becoming jet black.

On dead branches, especially of oak.

*E. recisa*.—Soft and gelatinous, about 1 in. across, amber-brown, attached by a point.

On dead willow branches.

*E. albida* (Pl. XXX, fig. 1).—Gelatinous, forming irregular masses bursting through the bark, at first pure white, becoming brownish when old.

Very common on decayed branches, forming patches  $\frac{1}{4}$ – $\frac{1}{2}$  in. across.

## TREMELLA

Soft and gelatinous, variously lobed and twisted or forming a mass of irregularly flattened lobes, surface smooth.

Distinguished by the very soft, subgelatinous substance, forming brain-like or foliaceous tufts. Often brightly coloured.

*T. saccharina*.—Forming tuberculose, variously twisted and wavy, tawny cinnamon tufts, 1–2 in. across.

Colour of crystallized sugar, becoming tawny.

On fallen pine trunks.

*T. foliacea*.—Gelatinous, tufted and very irregularly lobed, many thin plates spring from a puckered base, pinkish cinnamon, often with a more or less decided violet tinge, tufts 1–3 in. across.

On stumps of pine and other trees.

*T. fimbriata*.—Very soft and gelatinous, tufted, erect, lobes soft and yielding, wrinkled, edges cut, blackish olive, 2–3 in. high, and the same in diameter when well grown.

Easily recognized by its very dark colour.

On dead branches.

*T. frondosa*.—Gelatinous, lobes many, wavy and twisted, pale pinkish yellow, 4–6 in. across.

The largest species. Very soft and gelatinous, almost slipping through the fingers when gathered.

On oak trunks, etc.

*T. lutescens*.—Very soft and gelatinous, lobes crowded, wavy, pale, then tinged yellow, 1–2 in. across.

Difficult to collect without deliquescing.

On stumps, fallen branches, etc.

*T. mesenterica* (Pl. XXX, fig. 2).—Gelatinous, but rather firm, clear orange-yellow, folds wavy, variously curved, and forming a brain-like mass 1–2 in. across.

A very common fungus, readily known by its clear, deep orange colour. Sometimes paler orange or deep yellow.

On dead branches, stumps, etc.

*T. atrovirens*.—Minute, bursting through the matrix to the surface, minutely papillose and wrinkled, dusky green when moist, blackish when dry. 1–3 lines across.

On dead branches of broom, etc.

*T. intumescens*.—Gelatinous; somewhat tufted, tufts rounded and broken up into numerous wavy lobes, brown, shining, becoming darker when dry, vaguely dotted, 1–2 in. across.

On trunks of beech, etc.

*T. vesicaria*.—Gelatinous, but externally firm, soft and bladdery within, much contorted, pallid or yellowish, tufts 2–3 in. high and broad.

Often becoming brownish when old.

On the ground.



*T. viscosa*.—Small, depressed, wavy, white, then grey.

Forming grey, flattened, small gelatinous patches; when dry resembling a thin, closely adpressed skin of a brown colour.

On dead wood.

*T. epigæa*.—Gelatinous, effused and depressed, wavy and contorted, thin, white, becoming pruinose.

Forming a small, thin white stratum.

On naked soil.

*T. indecorata*.—Gelatinous, bursting through the bark, or erumpent, sessile, rounded, moist, opaque, variously folded, dingy olive, becoming blackish brown when dry, 3–4 lines across.

Dirty grey, livid, or olive-brown, pitch-brown when collapsed and dry.

On willow, poplar, etc.

*T. moriformis*.—Sessile, erumpent, roundish or oblong, wavy, black with a purple tinge, internally deep purple, opaque, firm.

Small, resembling mulberries in miniature, remarkable for liberating a purple colour, when treated with hydrate of potash.

On rotten wood.

*T. versicolor*.—Gelatinous but firm, orbicular, orange, becoming brown; minute.

Forming minute orange, tear-like convex spots; paler when young, at length becoming rufous.

On the hymenium of *Corticium nudum*.

#### NÆMATELIA

Subgelatinous but firm, forming convex, convoluted or brain-like cushions with a central, white, opaque portion.

Readily distinguished when cut in half, vertically, by the presence of a white, hard nucleus or central mass. When dry, the white central body alone shows, the gelatinous covering being shrunk up to an almost invisible film, but when moistened it expands.

*N. encephala*.—Forming a firm, pale, flesh-coloured, wart-like mass,  $\frac{1}{2}$ –2 in. across, surface variously contorted, central mass large, white.

On pine and other wood.

*N. nucleata*.—Similar in form to *N. encephala*, but smaller, white, then tinged yellowish.

On rotten wood, branches, etc.

*N. virescens*.—Dingy green, about  $\frac{1}{2}$  in. across.

On furze branches.

#### TREMELLODON

Gelatinous, fleshy, attached by the side, under surface or hymenium covered with numerous pointed gelatinous spines.

Readily distinguished by its soft gelatinous substance, and by

the spines. Was at one time considered to be a species of *Hydnum*, but differing in microscopical structure.

*T. gelatinosum*.—More or less fan-shaped, fixed by a narrowed portion, 1–3 in. long, upper surface polished, brownish with an opalescent tinge; hymenium spiny, pale grey.

Our only gelatinous fungus with a spiny hymenium.

On pine stumps, branches, etc.

#### DACRYOMYCES

Gelatinous, forming small, wart-like convolute masses of a yellow or orange-colour on dead wood.

*D. deliquescens*.—Roundish or irregular, convoluted more or less, yellow, 1–4 lines across.

Fruiting best during winter, forming yellow convex masses on pine wood, boards, rails, etc., often growing in lines out of cracks in the wood.

*D. stillatus* (Pl. XXX, fig. 8).—Similar in size to *D. deliquescens*, but firmer, and of a deep orange-colour.

On pine and other decaying wood.

*D. chrysocomus*.—Circular in outline and depressed in the centre or saucer-shaped, not wrinkled, golden yellow, about 1 line across.

On rotten pine wood.

*D. macrosporus*.—Gelatinous, forming rosy tubercles or warts, forming patches up to  $\frac{1}{4}$  in. long.

On dry branches.

*D. succineus*.—Subgelatinous, gregarious, smooth, amber-colour, paler externally when moist, rather thick, collapsing when dry.

This species is said to be the conidial condition of an ascomycetous fungus, *Peziza electrica*.

On dead pine leaves.

*D. sebaceus*.—Gelatinous but firm, cup-shaped, whitish. Conspicuous in wet weather, 2–4 lines broad.

On branches.

*D. torta*.—Gelatinous, rounded, depressed, tuberculate, and with the surface wavy and lobed, yellow or orange.

Differs from *D. deliquescens* by the smaller spores, which are 3-septate and measure  $12 \times 4-5 \mu$ .

On decorticated oak branches.

#### CALOCERA

Gelatinous but firm, growing erect, simple or much branched.

The largest and most frequent species resembles a deep orange-coloured *Clavaria*, differing in its distinctly gelatinous, tough substance. The smaller species are dingy orange, and grow gregariously on wood.



*C. viscosa* (Pl. XXVII, fig. 8).—Viscid and tough when moist, horny when dry, forking into many long, straight branches, clear, deep orange, with a long, white rooting base, 2–3 in. high.

Common on decaying pine stumps.

*C. cornea*.—Growing in small tufts, upright, tapering, rarely with a short branch, pale orange-yellow,  $\frac{1}{4}$ – $\frac{2}{3}$  in. high.

Resembling slender orange spikes projecting from the dead wood. Often growing in large quantities.

*C. stricta*.—Somewhat resembling *C. cornea*, but growing singly and not at all branched,  $\frac{1}{2}$ –1 in. high.

On trunks, yellow, rigid when dry.

*C. striata*.—Simple (=unbranched), about  $\frac{1}{2}$  in. high, tip sharp, yellow, longitudinally wrinkled when dry.

Somewhat resembling *C. cornea*, but distinguished by being solitary, and wrinkled when dry.

On trunks.

*C. glossoides*.—Simple, solitary, yellow, somewhat gelatinous, round and slender below, thickened and flattened above, tip blunt, about  $\frac{1}{2}$  in. high.

On trunks.

#### DACRYOPSIS

Small, subgelatinous, shortly stipitate, the fertile portion capitate or forming a head, which is at first covered with conidia, followed by basidia bearing spores.

Distinguished, under the microscope, from very similar-looking fungi by the surface of the head at first bearing a crop of minute conidia, borne on very slender threads or conidiophores. These are followed by normal basidia bearing two spores each.

*D. nuda*.—Gregarious. Head 1–2 lines across, hemispherical, flattened below, reddish orange (conidia elliptic-oblong,  $3 \times 1 \mu$ ; spores elliptic-oblong, 3-septate,  $14 \times 5 \mu$ ).

On fir stumps.

#### DITIOLA

Hymenium discoid, gelatinous, running down into a firm, stem-like rooting base.

This genus should perhaps be merged into *Dacryopsis*, but the layer of conidia preceding the spores has not as yet been observed.

*D. radicata*.—Hymenium plane or slightly depressed, golden yellow, running down as a stout, simple or branched, white, downy rooting base (spores elliptic-oblong, 1-septate,  $8$ – $12 \times 4$ – $5 \mu$ ).

Rooting base  $\frac{1}{2}$ – $\frac{2}{3}$  in. long, hymenium 2–3 lines across, clear yellow.

On rotten wood, among fallen pine leaves, etc.

## APYRENIUM

Subglobose, gelatinous, hollow, the hymenium covering the entire outer surface.

Distinguished amongst the Tremellinaceæ by the entire structure being inflated and persistently hollow. This is considered to be a spurious genus, the species being suspected of being conidial conditions of ascigerous fungi belonging to the genus *Hypocrea*. This opinion awaits corroboration, or otherwise.

*A. lignatile*.—Sessile, rounded but variously deformed, smooth, externally and internally pale yellowish, collapsing when dry, and becoming wrinkled. Up to  $\frac{1}{4}$  in. across.

Sometimes showing a reddish tinge when dry. Supposed to be a stage of *Hypocrea rufa*.

On pine wood, decaying fungi, etc.

*A. armeniacum*.—Subgelatinous, lobed, peach-colour, 1–2 lines across.

Smaller than *A. lignatilis*, more irregularly lobed, and brighter in colour. Said to be a conidial form of *Hypocrea gelatinosa*.

On oak chips, decaying fungi, etc.

## GYROCEPHALUS

Erect, narrowing downwards into a short stem, more or less spoon-shaped, irregular, between cartilaginous and gelatinous. Hymenium on one surface only of the flattened portion.

*G. rufus*.—Erect, flattened and more or less concave, spoon bowl-shaped or very obliquely funnel-shaped, somewhat gelatinous, but very variable in shape, tapering downwards into a short stem, 2–3 in. high and nearly as wide, orange to red or scarlet above; stem orange.

On rotten trunks and on fragments of wood, and on the ground under conifers. Very rare.

## GUEPINIA

Substance between cartilaginous and gelatinous, unequally or obliquely saucer-shaped, substipitate.

*G. peziza*.—Cup-shaped or saucer-shaped, attached obliquely to the tapering stem; hymenium yellow or orange, about  $\frac{1}{4}$  in. across.

Cup oblique, often irregular, hoary, and often tinged with pink when dry.

On dead branches, trunks, etc.

*G. obliqua*.—Cap slightly concave, attached obliquely to the stem, which is very short and tapering downwards; hymenium bright orange, tinged with pink when dry, 1–3 lines across.

On wood. Gregarious.



## FEMSJONSIA

Cup-shaped or saucer-shaped, distended with a gelatinous central portion, tapering below into a rooting, stem-like base.

Differs from *Guepinia* in the cap not being attached obliquely to the stem.

*F. luteoalba*.—At first cup-shaped, then plane, finally convex and wrinkled, yellow; stem downy and whitish with just a tinge of yellow, rooting, about  $\frac{1}{2}$  in. diam.

On branches of various trees.

## Order GASTEROMYCETES

The species of this large order, like those of the Hymenomycetes, are world-wide in their distribution. As opposed to the Hymenomycetes, a dominant feature of the present group is that the hymenium or spore-bearing portion of the fungus remains completely enclosed in a continuous wall or peridium, or within a universal veil or volva until the spores are fully formed, when, except in the underground species, the peridium or volva is ruptured in some manner, and the spore-producing portion of the fungus is enabled to liberate its spores into the air. In many species the fungus remains entirely underground until the spores are quite mature, when the spore-bearing portion is lifted above ground on a long stem for the purpose of accomplishing spore diffusion. This rule holds good in the Phalloidaceæ or stink-horns, *Battarreia*, and several exotic genera.

In the Hymenomycetes spore diffusion is mainly effected through the agency of wind; but in the Gasteromycetes there are three distinct and well-marked modes of spore diffusion. In the most primitive and least differentiated family, the Hymenogastreæ or false truffles, the species are permanently subterranean, and, broadly speaking, present the appearance of small potatoes or bulbs. The entire spore-bearing portion or hymenium is surrounded by a comparatively stout wall or cortex, which presents no arrangements for the escape of the spores, and even if they did escape they could not spread to any material extent in the soil. All such subterranean fungi possess a very strong smell, varying in different species from musk to asafoetida. The object of this scent, which is only developed when the spores are mature, is to indicate to animals, more especially rodents, their whereabouts. When discovered, they are promptly eaten, and the spores, after passing through the alimentary canal uninjured, are dispersed far and wide.

A second method of spore diffusion, effected by wind, is met with in those species that are developed above ground, as the puffballs—*Lycoperdon*, earth-stars—*Geaster*, etc. In all such species there is a specialized opening or mouth in the wall of the peridium, through which the spores can escape into the air. There are also present,

mixed with the dry mass of spores, certain very fine, elongated threads or hyphæ, which may be simple or branched and with fine, tapering ends. These threads are collectively termed the capillitium, which is considered to assist in the expulsion of the spores from the spore-sac or peridium.

The third mode of spore dissemination is met with in the stink-horn family, the Phalloideaceæ. All the members of this family remain fairly deeply buried in the ground and enclosed in a universal veil or volva until the spores are mature. When this condition is reached the hymenium or spore-bearing portion bursts through the volva, and is raised into the air on a very quickly developed, long stem. The spores are always exceedingly minute, and when the hymenium becomes exposed to the air its components, basidia, paraphyses, etc., at once deliquesce and form a very powerful, evil-smelling, very sweet-tasted gluten, in which the minute spores are embedded. This gluten is greedily devoured by flies of various kinds, who are attracted by the powerful smell and brilliant red colours of many species. Some spores adhere to the legs of the insects and are afterwards deposited here and there, and are eventually washed to the ground by rain. Others pass through the digestive tract of the insect without experiencing any harm, and many such eventually find their way to the ground.

The deliquescence of the basidia and other elements constituting the hymenial layer during some stage of development, for the purpose of liberating the spores, is a common feature in the Gastromycetes. In some of the puffballs and others, although the basidia deliquesce, the sterigmata or little spicules at the apex of the basidium, and which bear the spores, are persistent and remain attached to the spores, which in consequence resemble miniature drumsticks when seen under the microscope.

#### KEY TO THE FAMILIES

Subterranean. More or less tuberous ; peridium indehiscent ; gleba usually traversed by veins or dissepiments ; capillitium entirely absent. Usually strong smelling at maturity.

*Hymenogasteraceæ.*

Developed at the surface of the ground. Peridium thick, not composed of distinct layers, dehiscing by the irregular splitting or by the decay of the upper portion ; gleba traversed by veins ; capillitium entirely absent.

*Sclerodermaceæ.*

Developed above ground. Peridia at first closed, then widely expanded. Contents of the gleba forming peridiola, or hard bodies, containing the spores in their interior.

*Nidulariaceæ.*

Developed above ground. Peridium consisting of two or more distinct layers ; spores forming a dry, powdery mass at maturity, and mixed with a well-developed capillitium.

*Lycoperdaceæ.*



Development taking place underground. Volva at first continuous, with a thick, gelatinous middle stratum; spores very minute, when mature immersed in a greenish mucilage, which is elevated out of the volva on a long stem or receptacle.

*Phalloideaceæ.*

#### HYMENOGASTRACEÆ

The principal characteristics of the present group are the subterranean habit, entire absence of a capillitium, gleba not becoming resolved into a dry, powdery spore-mass at maturity, and the indehiscent peridium.

The species are, as a rule, more or less subglobose in form, and vary in size in different species from a pea to that of a walnut. The mycelium is usually copious, and often forms fleecy masses spreading amongst vegetable humus at a slight distance from the surface. In some species of *Melanogaster*, etc., the mycelium forms long, spreading, cord-like strands which produce ascophores at various points; hence it is not unusual to meet with clusters of ascophores of various ages and sizes in the same locality.

The majority of species grow under trees, which suggests that the mycelium may form mycorrhiza on the roots of the trees, as has been shown to be the case between the mycelium of species of *Elaphomyces* and the roots of conifers. In many species there is no obvious point of attachment, the mature ascophore lying perfectly free and unattached. In other species there is a more or less distinctly marked sterile base, indicating the original point by which the fungus was attached to the substratum. This sterile base, shadowed in in the present family, becomes more highly evolved and differentiated in some of the puffballs, etc., until it eventually resolves itself into a differentiated stem, which in the above-ground fungi is of use in elevating the spore-bearing portion of the fungus, and thus facilitating the dispersion of the spores by wind, etc. As usual in primitive or ancient types of fungi, the spores are exceptionally large, coloured, and the surface of the wall is frequently ornamented with a network of ridges, warts, spines etc. The basidia are somewhat erratic in their mode of development, producing a variable number of sterigmata, and have not settled down to producing the stereotyped number of four, as is usual in most of the agarics. No special provision is made for the dispersion of the spores by the aid of physical agents, and apparently the common mode of dispersion is through the ascophores being eaten by animals; and even here the arrangements for such means of dispersion are not so highly differentiated as in the Tuberaceæ or truffle family, where the majority of species possess a penetrating smell, which indicates to animals, more especially rodents, their whereabouts.

None of the species, with one exception, are edible; neither are

they directly poisonous, but lack the aroma of many of the truffles, which are by common consent voted nasty, to say the least, on first acquaintance, but which, due to perseverance and a feeling that it is the proper thing to do, are eventually said to be delicious.

## KEY TO THE GENERA

A. *Wall (epispore) of spores rough.*

Peridium having the surface cottony ; sterile base well developed.  
*Octaviania.*

Peridium smooth or only silky ; sterile base present.

*Hymenogaster.*

Sterile base of peridium absent.

*Hydnangium.*

B. *Wall of spores smooth.*

Peridium furnished with numerous branched fibres springing from various points of its surface and becoming free from it.

*Melanogaster.*

Peridium furnished with numerous branched fibres which remain adnate or attached to its surface.

*Rhizopogon.*

No fibres springing from the surface of the peridium ; spores minute.

*Hysterangium.*

## NOTES ON THE GENERA

## OCTAVIANIA

The general aspect of the various genera included in the Hymenogastraceæ are, comparatively speaking, much alike externally, and in all cases attention must be paid to microscopic distinctions, more especially the spores, to obtain a clear idea as to genera or species. The peridium being covered with a layer of cottony down or mycelium, at least during the early stage of growth, in addition to the copious web of white mycelium in the ground from which the peridia originate, along with the well-marked sterile base of the peridium, which can be seen when the peridium is cut in half, are the principal indications of the present genus, which can only be verified by an examination of the spores and the characters presented by the gleba.

## HYMENOGASTER

In this genus a section of the peridium should show a well-developed sterile base and the cavities of the gleba quite empty when young, and usually obviously radiating from the sterile base. These characters, supported by the absence of a distinctly cottony coating of the wall of the peridium in the young condition, suggest the genus *Hymenogaster*.

## HYDNANGIUM

In this genus the brightly coloured gleba and no sterile base, supported by the globose spores, as seen under the microscope characterize *Hydnangium*.



## MELANOGASTER

No sterile base present, and, as denoted by the generic name, the gleba is usually blackish or, at all events, quite dark-coloured at maturity. The cells of the gleba are quite small at the periphery, and gradually increase in size towards the centre of the gleba. Some species are very strong-scented. Many branching fibres spring from various points of the peridium.

## RHIZOPOGON

Sterile base absent. The surface of the peridium is traversed by branched, rooting fibres or strands of mycelium which mostly remain adnate or attached to the wall of the peridium throughout the greater portion of their length. These strands originate from the mass of vegetative mycelium upon which the peridia or fruiting-bodies of the fungus rest. The cavities of the gleba are empty at first ; that is, until they become filled with spores produced on the surface of the walls enclosing the cavities.

## HYSTERANGIUM

No sterile base present. A feature of the present genus is that in an early stage of development the consistency of the gleba is more or less mucilaginous, and the entire fungus closely resembles the undeveloped or "egg" condition of *Mutinus caninus*. The peridia are seated on a copious development of white mycelium.

## OCTAVIANIA

Peridium continuous or becoming cracked, but not perforated, with a well-developed sterile base, externally cottony ; trama readily splitting into two layers ; cavities at first empty, peripheral ones small and more or less circular, becoming larger and irregular in form towards the centre ; spores coloured, rough.

Differs from *Hydnangium* by the presence of a distinct sterile base, and from *Melanogaster* in the cavities of the gleba being empty at first, and in the byssoid nature of the tramal plates surrounding the cavities in the gleba.

*O. asterosperma*.—Peridium subglobose or irregular in form, dirty white, becoming stained here and there with greenish blue or black, sterile base thickish ; cells irregular in form, the central ones largest,  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across ; spores globose, coarsely echinulate, 14–15  $\mu$  diam.

Peridium globose or irregular, mycelium abundant, attached to twigs and leaves underground, wall of peridium continuous or cracked into areas, downy, whitish, becoming greenish blue or black when bruised and exposed to the air.

Underground amongst rotten twigs, leaves, etc.

*O. stephensii*.—Peridium usually irregularly oblong, base wrinkled or puckered and pitted, with white, branching strands of mycelium, externally rufous; inside white, liberating when cut a white, milky juice which turns red when exposed to the air, about  $\frac{3}{4}$  in. across; cells of the gleba minute; spores globose, echinulate, pale brown, 11–14  $\mu$  diam.

A remarkable species, readily distinguished by its oblong, smooth peridium and the puckered base ending in white, root-like mycelium. The red colour assumed by the white, milky fluid is not permanent. Smell slight.

Underground among humus, dead leaves, etc.

*O. compacta*.—Peridium globose or of irregular form, whitish, minutely downy; cells of the gleba globose or irregularly oblong, minute, soon filled with spores; tramal walls indistinct,  $\frac{1}{4}$ – $\frac{1}{2}$  in. across; spores globose, minutely warted, pale yellow at first, then brighter, 5–6  $\mu$  diam.

Peridium with a dense rooting mass of snow-white mycelium. Usually gregarious.

Underground or half buried.

#### MELANOGASTER

Peridium not furnished with a proper basal point of attachment, hence no sterile basal portion is present; branched fibres spring from every point of the surface; cells of the gleba more or less circular in outline, peripheral ones small and becoming larger as the centre is approached, septa thick, continuous with or springing from the inside of the wall of the peridium; spores smooth, coloured.

The present genus is characterized by the absence of a sterile basal portion, branched fibres traversing the whole surface of the peridium, and the smooth spores.

*M. variegatus*.—Peridium irregularly globose, at first ochraceous or clear yellow, changing to reddish rust-colour, covered with adpressed down; tramal plates whitish, then bright orange, pulp in the cavities, black,  $\frac{2}{3}$ – $1\frac{1}{2}$  in. diam. (spores brown, smooth, elliptic-oblong,  $10 \times 5 \mu$ ).

Underground under trees.

var. *broomeianus* (fig. 4, Pl. B).—Peridium subglobose or irregular in form, ochraceous, then rusty red, minutely downy; walls or tramal plates bounding the cavities of the gleba, whitish or tinged yellow, pulp in the cavities black (spores clear brown, elliptic-oblong, smooth,  $9\text{--}10 \times 4\text{--}5 \mu$ ).

Differs from the typical form in not having the tramal plates bright yellow or orange. This variety is sold in the market at Bath under the name of Red Truffle, and is eaten there in preference to the common truffle, *Tuber aestivum*. It grows in clusters of five or six, and several such clusters are usually found under the same



tree, some of the plants being more or less exposed, others buried. When fresh it is minutely downy, of a reddish ochre, which becomes dull when handled much or badly dried. At first white within, then very pale yellow, at length dusky.

In the ground under beech trees, Lombardy poplars, etc.

*M. ambiguus*.—Globose or elliptical, very foetid, nearly even and smooth, pale olive, becoming brownish when exposed to the air; septal plates white, about 1 in. across (spores obovate or elliptical, apex variable, acute or blunt and papillate, smooth, brown, 13–15  $\times$  7–8  $\mu$ ).

Differs from *M. variegatus*, var. *broomeianus*, in its much larger ovate spores with a papilla at the apex, and by its powerful smell, resembling asafœtida. Berkeley says that a single specimen in a room emits so powerful an odour as to make it scarcely habitable.

Under fir trees, etc.

var. *intermedius*.—Spores obovate, obtuse, even, very rarely papillate.

About the size of *M. variegatus*, bright rusty-colour, but the spores are much larger, equalling in size those of *M. ambiguus*, but of a very different shape; there is rarely an indication of a papilla, and the general form is obovate. The smell resembles that of *M. ambiguus*. The septa are yellow when fresh, becoming red when dried.

Partly underground, under trees.

#### HYDNANGIUM

Peridium fleshy or quite thin, smooth or silky, sterile base absent; cells of the gleba minute, at first empty, becoming filled with spores (spores globose or subglobose, pale-coloured, echinulate).

The globose or subglobose, echinulate, coloured spores, which are small, and the absence of a sterile base separate this genus from its closest ally, *Octaviania*.

*H. carotæcolor* (fig. 2, Pl. B).—Peridium oblong, without any obvious point of attachment, wall thin, wrinkled, slightly downy, brick-red or carrot-colour, orange within; cells of the gleba hollow, about  $\frac{3}{4}$  in. diam. (spores pale yellow, subelliptic, coarsely echinulate, 15–18  $\times$  12–13  $\mu$ ).

Peridium pale orange-red to brick-red, inside bright carrot-colour, not deliquescent.

Under trees. Sometimes half exposed.

*H. carneum*.—Peridium subglobose or irregular, externally flesh-colour, inside paler flesh-colour, unchangeable in tint, about  $\frac{2}{3}$  in. across (spores globose, with long, slender, pointed spinules, pale pinkish brown, about 12  $\mu$  diam.).

The peridium is at first covered with white, fugacious down.

Underground or partly exposed.

## HYSTERANGIUM

Peridium wall entirely continuous and truly indehiscent, separable; gleba rather soft and glutinous, cavities at first empty, then containing spores; spores minute, smooth, coloured.

Recognized by the small, smooth, elliptical spores and the cartilaginous-mucus consistency of the gleba. There is often an abundant development of mycelium accompanying the fungus, more especially in the young condition of growth.

*H. nephriticum*.—Peridium globoso-depressed, surrounded by a much branched web of white mycelium, wall rather thick, elastic, at first snow-white and downy,  $\frac{1}{2}$ –1 in. across; gleba pale blue or greyish, here and there greenish; cavities minute, irregular, hollow, radiating from the base (spores elliptical, smooth, very pale in colour, about  $18-20 \times 5-6 \mu$ ).

Gregarious or sometimes crowded on each other, at first snow-white and downy, seated on a white, flat, branched mycelium which penetrates deeply into the soil, and is attached at various points to the peridium. When quite young the substance is entirely pale pink, changing to a pale blue or grey, with tinges of green here and there. Smell scarcely any at first, then like that of some species of *Hypericum*, at length exactly like that of a decaying puffball.

Underground or partly exposed, under trees.

*H. thwaitesii*.—Peridium subglobose, white, becoming brownish or rusty when bruised, wall very thin; cavities brownish olive, up to 1 in. across (spores oblong, apiculate, pale olive,  $25-30 \times 7-9 \mu$ ).

Mycelium white, fibrillose, not so copious as in *H. nephriticum*, and not forming a felted expansion, spreading for some distance.

Underground in woods.

## RHIZOPOGON

Peridium irregularly globose or oblong, wall thick and somewhat leathery or quite thin, continuous or becoming cracked and somewhat evanescent, with vein-like, branched fibres traversing its surface; substance of the gleba firm, cavities distinct, at first empty; spores smooth, pale-coloured.

Resembling *Hysterangium* in the smooth, elliptical spores, but readily distinguished by the cord-like, branched fibres running over the surface of the peridium to which they are adnate or attached.

*R. rubescens*.—Peridium ovate or subglobose, with a long, slender, rooting mycelium at first white and silky, becoming reddish when exposed to the air, yellow or olive when mature,  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across; flesh yellow, then pale olive; cavities or cells in the gleba numerous, small and irregular in form (spores elliptic-oblong, almost colourless, smooth,  $11 \times 4-5 \mu$ ).

When young it is almost transparent and resembles an un-



expanded "egg" of *Mutinus caninus*, being pure white and furnished with white strands or roots which spring from mycelium which spreads for an inch or two in the soil; in this condition it turns pink when touched; at a later stage it changes to yellow, with here and there a pinkish tinge. The smell very much resembles that of *Melanogaster ambiguus* when old, and when young has a sour or acid smell. It rapidly decays into a brown, foetid mass.

In the soil in sandy fir woods. Gregarious.

*R. luteolus*.—Peridium globose, oblong or ovate, whitish at first, soon becoming dingy yellow, then olive-brown, covered with numerous slender, free or adnate strands of mycelium; wall of peridium thick and somewhat leathery,  $\frac{2}{3}$ – $1\frac{1}{2}$  in. across; cells of the gleba minute, rounded, subequal, at first empty, becoming stuffed, walls surrounding the cells or cavities whitish (spores narrowly elliptic, smooth, for a long time colourless, then pale olive,  $8 \times 3 \mu$ ).

Smell at first weak, becoming strong and very offensive when old.

In sandy pine woods, etc. Underground or partly exposed, solitary or gregarious.

#### HYMENOGASTER

Peridium globose or irregular, wall fleshy or quite thin, simple, or consisting of one layer only, running down into a distinctly marked sterile base; cavities of the gleba at first empty, radiating from the sterile basal stratum, or irregularly scattered; spores elliptical or spindle-shaped, rough, coloured.

The large, coloured, elliptical or fusiform, rugulose or nodulose spores, cavities or cells of the gleba empty at first, and the sterile basal stratum of the peridium, stamp the genus.

*H. klotzschii*.—Peridium varies from subglobose to obovate, dingy white, fibrillose at the base,  $\frac{1}{2}$ –1 in. across, inside at first pallid, gradually changing to brownish ochre (spores broadly elliptical, ends blunt, minutely warted, pale brown,  $18\text{--}20 \times 11\text{--}13 \mu$ ).

Peridium white at first, then tinged yellowish, covered with very delicate adpressed down. The rooting fibres or strands of mycelium are slender.

Underground among loose soil.

*H. muticus*.—Peridium globose, quite white when young, becoming tinged brown and cracked, about 1 in. across; inside pale yellowish brown (spores obovate or oblong, ends very blunt, smooth, pale brown,  $18\text{--}21 \times 10\text{--}12 \mu$ ).

Peridium usually globose, but sometimes slightly lobed; distinguished by its peculiar spores. Much resembling in general appearance *H. olivaceus* and *H. lilacinus*. Smell very slight.

Underground, under trees, etc.

*H. luteus*.—Peridium subglobose, wall very thin, soft and silky, white, then brownish, about 1 in. across; inside bright yellow (spores smooth, elliptical or ovate, yellowish,  $24-28 \times 10 \mu$ ).

Distinguished by its permanently bright yellow interior, and smooth, papillate, very variable, often triangular spores. Some specimens have but very little smell, others, especially when of large size, have a powerful, very foetid smell.

Underground in woods, etc.

*H. decorus*.—Peridium subglobose, dingy white, becoming yellowish in places,  $1-1\frac{1}{2}$  in. diam.; lilac-brown inside, finally blackish; sterile base almost obsolete (spores broadly elliptical, obtuse, or obtusely apiculate, wrinkled, ochraceous, then brown,  $24-28 \times 13-15 \mu$ ).

Underground in woods, etc.

*H. vulgaris*.—Peridium subglobose, irregular in outline, whitish, becoming discoloured, rather soft, up to 1 in. across; gleba dingy white, becoming dark brown as the spores mature; cavities of the gleba rather large, irregular in form; sterile base minute (spores oblong or oblong-lanceolate, acute, narrowed at the base or point of attachment, wrinkled, blackish brown when mature,  $30-40 \times 12-14 \mu$ ).

Subglobose, regular, or variously lobed or grooved.

Underground in woods, etc.

*H. pallidus*.—Peridium rounded, somewhat flattened, something like a horse-bean in shape, nearly smooth, white, then dirty tan-colour, rather soft,  $\frac{1}{2}-\frac{3}{4}$  in. long; white within at first, then yellow, finally pale brown; sterile base obsolete (spores lanceolate, acute, shortly pedicellate, rather rough,  $30-36 \times 12-14 \mu$ , brown).

Closely allied to *H. vulgaris*, differing in its more acute spores and in general colour.

On the ground in dry fir woods.

*H. citrinus*.—Peridium usually very irregular or deformed, often sulcate or grooved, with a silky sheen, lemon-yellow to golden yellow, gradually becoming rusty black,  $\frac{2}{3}-1\frac{1}{2}$  in. across; inside the same colour as the outside, substance firm (spores lanceolate, apiculate, reddish brown, wrinkled, opaque,  $40 \times 17-20 \mu$ ).

When quite young it is often greenish yellow, but this colour soon disappears when rubbed or exposed to the air. The yellow veins in the gleba, subfusiform, dark-coloured, rough spores, and the cheese-like smell, which is communicated to everything in the proximity of the fungus, are its most pronounced distinguishing features.

Underground, in woods under trees.

*H. olivaceus*.—Peridium angularly globose, at first silky, whitish, becoming rufescent when touched,  $\frac{3}{4}-1\frac{1}{2}$  in. diam.; internally whitish at first, then changing from buff to rusty olive; walls of



the trama white (spores broadly fusiform, with a sharp point at each end, pedicellate, brown, generally quite smooth,  $25-30 \times 13-14 \mu$ ).

Peridium variable in size, at first white with a tinge of lemon-colour, gradually changing to a dull buff-colour, and finally to reddish grey or brown. Smell like that of *Lactarius theiogalus*.

Underground in woods. A common species in the West of England.

var. *modestus*.—Spores narrowly fusiform, smooth, pale amber,  $25-26 \times 8-9 \mu$ .

This form is intermediate between *H. citrinus* and *H. olivaceus*, differing from the former in being of a pale watery brown colour inside, and of a softer texture, and having the spores exactly intermediate between those of the two species. The smell resembles that of *H. citrinus*, but is not so strong.

Underground in dry fir woods.

*H. tener*.—Peridium small, subglobose, soft, white and silky,  $\frac{1}{2}-\frac{3}{4}$  in. across; inside pale pink, then becoming greyish umber as the spores ripen; sterile base well marked, white (spores broadly elliptical, with a papilla at the apex, minutely warted or wrinkled, ochraceous,  $30 \times 14-16 \mu$ ).

Smell like that of *Lactarius theiogalus*.

Underground in woods. Not uncommon.

*H. thwaitesii*.—Peridium subglobose, firm, dirty white, becoming discoloured here and there, up to 1 in. across; internally brown (spores globose, rather rough, apex with a minute papilla,  $11-13 \mu$  diam.).

Characterized by the globose or subglobose spores, which are either quite obtuse or minutely apiculate.

Underground in woods.

*H. griseus*.—Peridium globose or more or less irregular in form, pale brown, at first covered with whitish down, up to  $\frac{1}{2}$  in. across; cavities of the gleba minute, grey, becoming blackish as the spores mature (spores fusiform or spindle-shaped, irregularly warted, dark umber-brown,  $28-32 \times 20 \mu$ ).

Varying in size from that of a pea to a small bean; smell pleasant, resembling that of the lily of the valley.

Among leaf-soil. Only found up to the present in Epping Forest.

*H. pusillus*.—Peridium obovate or somewhat depressed, white, 2-3 lines broad; sterile base large in proportion, inside dingy white, cavities of the gleba large (spores broadly elliptical, with a papilla at the apex, becoming slightly rough at maturity, with a dull reddish tinge,  $14-16 \times 10 \mu$ ).

Strongly resembling, superficially, the sclerotium called *Sclerotium complanatum*.

On mossy ground.

## SCLERODERMACEÆ

Peridium thick, formed of one layer, narrowed below into a short, stout, stem-like rooting base, liberating the spores by splitting into irregular teeth at the apex, or by the upper portion of the peridium becoming disintegrated.

Differs from the subterranean Hymenogastraceæ in the well-defined, stem-like base of the peridium, and in being developed above ground.

## KEY TO THE GENERA

Peridium subglobose, sessile or subsessile ; gleba powdery at maturity, blackish. *Scleroderma*.

Peridium subglobose, narrowed downwards ; gleba containing numerous hard peridiola, olive-brown at maturity. *Polysaccum*.

## NOTES ON THE GENERA

## SCLERODERMA

Peridial wall thick, consisting of a single layer, indehiscent, or in bursting at the apex into irregular teeth. Gleba at first white, compact, gradually becoming darker in colour as the spores ripen, until finally it is black with a tinge of purple, and traversed by very fine white lines, much broken up. The fungi are subglobose, sessile or nearly so, usually more or less depressed, dingy ochre, and more or less scaly or warted. Very common on the ground in woods and under trees. Smell sour when cut. Not edible.

## POLYSACCUM

Distinguished from *Scleroderma* by the presence of a fairly long stalk, which supports the more or less globose peridium. The gleba is filled with small globose bodies or peridiola, which contain the spores.

One of the rarest of our indigenous fungi, which has not been collected by anyone during recent years.

## SCLERODERMA

Peridium firm, warty or scaly, indehiscent or splitting into irregular teeth at the apex ; spore-mass blackish or tinged purple.

*S. vulgare* (Pl. XXXV, fig. 6).—Peridium subsessile, subglobose or globoso-depressed, sometimes ovate, plicate towards the base, whitish or pale brown, sometimes with a tinge of yellow, roughly scaly or warted, 1–3 in. across ; spore-mass blackish with a purple tinge.

Wall of peridium thick, flesh white, often becoming pinkish when cut. Smell sour.

Under trees. Often in clusters.

*S. verrucosum*.—Peridium subglobose, 1–3 in. across, covered with minute warts, ochraceous or dingy brown, wall thin, narrowed below into a stem  $\frac{1}{2}$ –1 in. long ; spore-mass umber.



## PLATE XXXV

1. MYRIOSTOMA COLIFORMIS
2. GEASTER FIMBRIATUS
3. SECTION THROUGH FIG. 2
4. CALVATIA GIGANTEA
5. GEASTER FORNICATUS
6. SCLERODERMA VULGARE
7. SECTION THROUGH FIG. 6



PLATE XXXV.





Differs from *S. vulgare* in the thin wall of the peridium and umber spore-mass without a violet tinge. The stem is sometimes quite short.

Under trees.

*S. bovista*.—Subsessile; often irregular in form, 1–2 in. across, wall thin, pliant, almost smooth; spore-mass olive-brown interspersed with thin yellow streaks.

Distinguished by the almost smooth peridium, and the yellow streaks in the spore-mass.

Sandy soil under trees.

*S. geaster*.—Sessile, subglobose, 1–2 in. across, wall thick, rigid, almost smooth, brownish, splitting into irregular teeth at the top.

Sandy ground.

#### POLYSACCUM

Peridium irregularly globose, narrowed into a stout stem; peridium with numerous cavities containing peridiola.

*P. pisocarpium*.—Peridium 1–3 in. across, indistinctly nodulose, olive with a brown tinge, passing down into a stout, stem-like base; peridiola minute, yellow.

Sandy ground. Very rare.

#### NIDULARIACEÆ

The commonest and most typical representatives of this family are popularly known as “birds’-nest fungi,” on account of the general appearance of the peridium or enclosing membrane, with its contained peridiola, or structures containing the spores, to the nest of a bird containing eggs. The structure is somewhat peculiar. In the Gasteromycetes generally the gleba or spore-bearing mass is broken up in the early stage of development into a very large number of small, irregular cavities, by what appear to be veins, giving the gleba a more or less marbled appearance. These veins are in reality walls of tissue, corresponding functionally to the gills of agarics. That is, these walls give origin to the spores, which project into the cavities, which become filled with the spores. Now in the majority of genera, these walls entirely disappear at maturity, leaving the gleba as a dry, dusty mass of spores, as in the puffballs, or, if the walls persist, as in some subterranean species, they do not become hard. In the Nidulariaceæ, however, these tramal walls, as they are termed, do persist, and become very hard, and separate from each other, and lie free in the cavity of the gleba. If a section of one of these little hard bodies, or peridiola, as they are called, is examined under the microscope, the interior will be seen to contain many spores, which have been produced on basidia, that may be seen projecting from the inner surface of the wall into the cavity of the peridiolum. A somewhat similar formation of peridiola, only



not so highly differentiated, is met with in *Polysaccum*, a genus connecting the two families, Sclerodermaceæ and Nidulariaceæ.

All the species are small, some quite minute, and grow on manure, rich soil, wood, chips, dead leaves, or any kind of decaying vegetable matter.

#### KEY TO THE GENERA

Peridium cup-shaped or bell-shaped, mouth widely open at maturity; peridiola compressed, with a depression on one side, from the centre of which an elastic cord springs, which attaches the peridiolum to the wall of the peridium. *Cyathus*.

General structure as in *Cyathus*, only the peridiola have a minute wart, instead of a depression on one side, from which the elastic cord originates that attaches the peridiolum to the wall of the peridium. *Crucibulum*.

General appearance of *Crucibulum*, only there is no elastic cord attaching the peridiola to the wall of the peridium, and the peridiola are involved in mucus. *Nidularia*.

Minute. Peridium splitting at maturity into several sharp teeth at the apex. *Sphærobolus*.

Peridiolum solitary, projecting from the apex of the peridium at maturity. Minute. *Thelebolus*.

#### NOTES ON THE GENERA

##### CYATHUS

The members of this genus are to some extent known in this country as "birds'-nest fungi," on account of the more or less nest-like peridia, containing a number of peridiola or egg-like bodies lying loosely at the bottom of the peridium. The distinction between the genera turns on minute details, which require careful observation with a good pocket lens. In this genus the peridiola are attached to the inside wall of the peridium by a long elastic cord, which is attached to the peridiolum in the middle of a slight depression or umbilicus, situated on one of its flattened sides.

##### CRUCIBULUM

The general aspect of the entire fungus is similar to that of the species of *Cyathus*, but the slender cord or funiculus attaching each peridiolum to the inner wall of the peridium is attached to a projecting, nipple-like structure situated on one side of the peridiolum, instead of being attached at the centre of a depression, as in *Cyathus*.

##### NIDULARIA

This genus is much less differentiated than in the two preceding genera. It consists of a single thin membrane, which collapses over the enclosed peridiola, and eventually opens by a more or less regular mouth, or altogether irregularly. The important point to

observe is that the peridiola are quite free in the peridium, and not attached to its inner wall by elastic threads. They are involved in mucus.

#### SPHÆROBOLUS

In the three preceding genera the peridium contained several peridiola. In the present genus only one peridiolum is present in the peridium. The peridium consists of two distinct walls or layers. At maturity the outer walls split open at the apex or top into several sharp-pointed teeth or segments. Following this rupture the inner wall suddenly becomes inverted through the opening in the outer peridium, and in the act of so doing, shoots its contained peridiolum into the air. The whole fungus is only 1-2 lines across.

#### THELEBOLUS

This genus agrees with *Sphærobolus* in the peridium containing only a single peridiolum, but it is much simpler in structure generally. The wall of the peridium consists of a single layer only, and the peridiolum at length protrudes through the apex of the peridium, but is not shot away. The individual peridia are not a line across, yellow, and aggregated in crowds on a dense white, cottony mycelium, running over wood, rotten leaves, etc.

#### CYATHUS

Peridium consisting of three distinct layers, the apex at first closed by a membrane, then becoming open and expanded, more or less bell-shaped; peridiola lentil-shaped, attached to the peridium by an elastic thread.

Known by the wall of the peridium being composed of 3 layers (seen in a microscopic section only), and by the peridiola having a depression on one side, from which the attachment cord springs.

*C. striatus* (Pl. XXVII, fig. 6).—Obconic, apex truncate, at first closed by a membrane, lead-colour and striate inside, hairy and brownish outside,  $\frac{1}{2}$ – $\frac{3}{4}$  in. high; peridiola subcircular, compressed.

Known by the fluted inside of the peridium.

On wood, twigs, fir cones, etc. Tufted.

*C. vernicosus*.—Bell-shaped, broadly open, inside even, dull lead-colour, about  $\frac{1}{2}$  in. high; peridiola circular, biconvex, blackish.

Differs from *C. striatus* in being even and not fluted inside the peridium.

On the ground. Tufted.

#### CRUCIBULUM

Wall of peridium double, mouth at first closed by a flat membrane, then expanded and bell-shaped; peridiola numerous, compressed, attached to the peridium by a long cord springing from a nipple-like projection on one side of the peridiolum.

Differs from *Cyathus* in the thread springing from a projection, and not from a depression on one side of the peridiolum.



*C. vulgare*.—Peridium thick, greyish buff, smooth and shining inside, downy outside ; peridiola circular, biconvex, pale.

Becoming broadly open and bell-shaped, about  $\frac{1}{4}$  in. across.

On wood, twigs, etc. Tufted.

#### NIDULARIA

Peridium formed of a single membrane ; peridiola numerous, involved in mucus, not attached by a cord to the peridium.

Distinguished from *Cyathus* and *Crucibulum* by the peridiola not being attached to the wall of the peridium by a cord or funiculus.

*N. pisiformis*.—Peridium sessile, hairy, dirty buff, nodulose above, splitting irregularly, about  $\frac{1}{4}$  in. across ; peridiola biconvex, brown, shining.

On the ground, wood, leaves, etc. Solitary or gregarious.

*N. berkeleyi*.—Subglobose, hairy, thick, cinnamon, inside velvety, cinnamon, about  $\frac{1}{4}$  in. across, becoming broadly open ; peridiola many (40–50), biconvex, brown, shining.

On wood and chips. Solitary or clustered.

*N. confluens*.—Peridium thin, subglobose, downy, whitish, irregularly torn above ; peridiola numerous, circular, compressed, smooth, wrinkled when dry.

On chips and amongst leaves. Crowded and often irregular from mutual pressure.

*S. dentata*.—Turban-shaped, pale buff, rather woolly, with about five small, sharp teeth round the edge ; peridiola reddish brown.

Several growing together on rotten sticks. This species was described many years ago, and has not been seen now for many years.

#### SPHÆROBOLUS

Peridium composed of two layers, splitting into several sharp-pointed teeth above, the inner wall becoming exerted elastically, and ejecting the single peridiolum to a considerable distance.

Known by the peridium splitting in a stellate manner at the apex, and by the single peridiolum.

*S. stellatus*.—Peridium pale yellow or whitish, about  $\frac{1}{10}$  in. across, splitting at the apex into several sharp teeth ; peridiolum broadly elliptical.

The peculiar structure of the peridium is for the purpose of effecting the dispersion of the spores contained in the sporidiolum. The fungus is subglobose when young ; when mature the two layers of the peridial wall split into several sharp-pointed teeth at the top, the inner layer then suddenly contracts and becomes inverted through the toothed opening, having in the act ejected the peridiolum to some distance away.

The fungus is by no means uncommon on rotten wood, twigs, etc., in damp places, usually crowded, and connected by cobweb-like

mycelium. If a few twigs bearing the fungus are placed on damp moss under a tall bell-jar, their peculiar mode of spore ejection may be observed. When the peridiolum is ejected, its contact with the glass causes a ringing sound that can be distinctly heard by anyone in the room. The peridiola are shot to a distance of one foot or more, and, being viscid, adhere to the glass.

#### THELEBOLUS

Wall of peridium single ; peridiolum solitary, protruding from the apex of the peridium.

Differs from *Sphærobolus* in the single wall of the peridium, and in the sporidiolum not being ejected elastically.

*T. terrestris*.—Peridium sessile on a broad base, hemispherical, then somewhat contracted above, yellow, surmounted by the solitary globose sporidiolum.

Peridia gregarious, about  $\frac{1}{10}$  in. across, seated on a dense weft of mycelium often extending for 1–2 inches.

On dead wood, leaves, or on damp ground.

#### LYCOPERDACEÆ

The most typical representatives of this family are popularly known as “puffballs.” Considerable diversity of structure is met with in the group. In every instance the gleba or spore-bearing surface is at first completely enclosed in a continuous peridium or membrane. The wall of the peridium consists of two or more distinct layers or strata, and the modifications that these different layers undergo during development constitute the most important generic distinctions. In *Bovista*, for instance, two distinct layers are present, both are smooth, and when the fungus is nearly mature, the outer layer becomes dry and breaks away in flakes, leaving the inner, persistent layer intact. In *Lycoperdon*, the outer layer, or cortex, ceases to grow and becomes rigid at an early period of growth. As the inner, still living layers continue to increase in size, the outer rigid layer, or cortex, becomes broken up into warts or spines, which, as a rule, eventually break away, or are easily rubbed off, leaving the inner layer smooth, and marked with patches indicating the points to which the warts or spines were originally attached. In *Geaster*, the entire fungus remains more or less globose or ball-shaped until the spores are mature, when the two outer layers of the peridium, adhering to each other, split from the apex of the fungus into several more or less sharp-pointed lobes or rays, which spread outwards ; within these spreading lobes, the third, or inner layer, remains in the form of a ball, unbroken, and containing a dense mass of spores, which escape into the air through a specialized mouth or opening. In some instances the two layers forming the outer spreading lobes separate from each other.

Another peculiarity met with in the members of the present



family is the presence of numerous very slender, simple or branched threads or hyphæ mixed with the spores. These threads collectively constitute the capillitium.

#### KEY TO THE GENERA

Wall of peridium consisting of two layers, the outer layer smooth and breaking away in irregular patches, leaving the blackish or dull lead-coloured inner layer entire, and with a small aperture at the apex, through which the spores escape. *Bovista*.

Cortex or outer layer of the peridium broken up into spines or warts, which fall away, leaving scars on the wall of the inner layer, which contains an opening at the apex for the escape of the spores. *Lycoperdon*.

The two layers of the wall of the peridium not separating. The upper portion of the wall of the peridium breaks away in irregular patches to admit of the escape of the spores. *Calvatia*.

The two outer layers of the wall of the peridium split from the apex into a number of pointed lobes or teeth, which bend outwards, exposing the unbroken inner layer containing the spores, which escape through a definitely formed mouth or opening at the apex. *Geaster*.

General structure agreeing with that of *Geaster*. Differing only in having several mouths or openings through which the spores escape, instead of one only. *Myriostoma*.

Resembling a minute *Lycoperdon*, about  $\frac{1}{2}$  in. in diameter, supported on a long, slender stalk. Recognized by having a minute collar surrounding the stem immediately below the peridium. *Tulostoma*.

Peridium circular in outline, much compressed, in other words, biconvex; supported on a very long, hard, fibrous stem, which is sheathed by a well-developed volva at the base. *Battarrea*.

#### NOTES ON THE GENERA

##### BOVISTA

The wall of the peridium is double, the outer layer becomes papery and breaks away in irregular flakes. The inner layer is parchment-like and persistent, dehiscing by an apical opening. Sterile base absent. The peridium is always sessile, and is not ornamented with spines or warts, as in the genus *Lycoperdon*.

##### LYCOPERDON

Wall of peridium composed of two layers, as in *Bovista*, but the outer one breaks up into spines or crowded warts, which often fall away as the fungus reaches maturity. The inner wall of the peridium is persistent, and dehisces by a definite opening at the apex. Sterile base usually well developed, often extending downwards as a more or less elongated, stem-like base.

## CALVATIA

Peridium with the general appearance of a *Lycoperdon*, but instead of dehiscing by a well-defined apical opening the upper surface breaks away in irregular patches. Our giant puffball belongs to this genus.

## GEASTER

Peridium at first entirely closed, subglobose or more or less pointed at the apex. The wall consists of three distinct layers. Eventually the two outer layers, remaining in contact with each other, split from above downwards into several sharp-pointed segments or portions which spread outwards, leaving the third or inner layer standing erect and filled with the spores, which escape through a well-defined small opening or mouth at the apex. These fungi have received the book-name of earth-stars, which, however, is not a genuine old English word, but an attempt to anglicize the scientific generic name.

## MYRIOSTOMA

Closely resembling species of *Geaster* in structure and general appearance; differing in possessing several mouths or openings in the upper surface of the inner peridium, through which the spores escape. Our only species, *Myriostoma coliforme*, is quite rare. I wonder why some creator of book-names has not called this fungus "the pepper-pot," as the idea is strongly suggested by the perforated endoperidium.

## TULOSTOMA

The single British species resembles a small puffball with a long, slender stem. The peridium is subglobose, dehiscing by a small apical opening, and is about  $\frac{1}{2}$  in. diam. The stem is rather coarsely fibrillose, slender, equal, 2-3 in. long. It grows on old walls, dry banks, etc., and is rare everywhere.

## BATTARREA

Again we have to deal with a single British species, which is exceedingly rare. It differs from other puffballs, but agrees with members of the Phalloidaceæ, in that the entire fungus is at first enclosed in a universal volva, the central layer of which is gelatinous. At maturity the globoso-depressed peridium bursts through the volva, and is elevated on a coarsely fibrous stem 8-14 in. in length, surrounded by a volva at the base. In the "egg" condition the fungus is buried for a depth of several inches in loose sand, humus, etc.

## BOVISTA

Peridium consisting of two distinct layers, the outer or cortex thin, smooth, becoming friable and breaking entirely away in



flakes, the inner layer persistent, tough, with a small opening at the apex ; spore-mass powdery at maturity ; capillitium consisting of loose, irregularly branched threads.

Distinguished from *Lycoperdon* by the smooth cortex, which breaks away in patches. When mature the plants break away from their support and are blown about by the wind ; the inner layer of the peridium is parchment-like in consistency, and persists for months.

*B. plumbea*.—Peridium globose or depressed globose, about 1 in. across ; cortex thin, whitish, breaking away, inner layer persistent, tough, thin, lead-colour, dehiscing by a small apical opening ; mass of spores umber-brown ; capillitium dense ; spores globose.

Dry grassy and heathy places. When young the fungus is white. Gregarious.

var. *ovalisporum*.—Differs from the type form in having somewhat larger, elliptical spores.

*B. nigrescens*.—Peridium globose, 1–2 in. across ; cortex thin, fragile, whitish, soon breaking away, inner layer tough, persistent, shining, blackish umber, dehiscing by an irregular apical aperture ; mass of spores umber with a decided purple tinge ; capillitium plentiful.

Closely related to *B. plumbea* ; distinguished by its larger size and by the spore-mass having a decided purple tinge. White when young.

Dry pastures and heathy places.

### LYCOPERDON

Peridium consisting of two distinct layers, the outer (=cortex) spiny or warted, often disappearing, the inner persistent, opening by a small determinate mouth, with or without a spongy, sterile base ; capillitium consisting of irregularly branched threads.

The species included in the genus *Lycoperdon* are known as “ puff-balls.” Differs from *Calvatia* in having a well-defined opening at the apex of the peridium for the escape of the spores. *Bovista* differs in both layers of the peridium being smooth ; the outer or cortex breaks away in flakes, leaving the inner parchment-like layer intact.

*L. echinatum*.—Peridium obovate or subglobose, 1–2 in. high, bristling with crowded, long, pyramidal, purple-brown spines between which are minute brown warts ; sterile basal stratum well developed, pale ochraceous, passing downwards into long, root-like, white strands ; mass of spores purple-umber ; capillitium dense.

The spines are often curved and split at the base ; after falling away a smooth scar is left on the surface of the peridium, surrounded by a ring of small warts.

On the ground in woods, among leaves, etc.

var. *hoylei*.—Closely resembling the type form, but distinguished by the sterile basal portion being very compact and bright olive-green in colour.

On the ground among leaves under trees, etc.

*L. atropurpureum*.—Peridium pear-shaped or subglobose, size variable, 1–2½ in. across, plicate below, sessile or the well-developed, large-celled sterile basal stratum continued as a short, stout, stem-like base; peridium thin, flaccid, with slender brownish spines which become shorter downwards; these soon fall away in the upper portion, leaving a smooth surface, dehiscing by a small, irregular apical opening; mass of spores at first olive, then dark umber, finally blackish purple; capillitium dense, threads coloured, irregularly branched.

Known from *L. echinatum* by the dark-coloured, large-celled sterile base and slender spines.

On the ground in woods, etc.

*L. gemmatum*.—Peridium subglobose or top-shaped with usually a subglobose head supported on a stout, cylindrical, well-developed sterile base; the head is usually lacunose on the under side, closely covered with large pointed warts, each of which is surrounded by a ring of minute warts, dehiscing by a small apical opening, 1–2½ in. across; spore-mass olive, then brown; capillitium dense, forming a central mass or columella, which can be seen when the spores are blown away; stem-like base, 2–5 in. high, stout, often lacunose.

Often growing in pairs from the same base. Known by the crowded warts, each surrounded by a ring of minute warts. When the large warts fall away, these rings of warts remain.

In woods and thickets, among grass, ferns, etc. Common.

*L. piriforme* (Pl. XXXVI, fig. 7).—Peridium pear-shaped to subglobose, usually umbonate, 1–2½ in. high, thin and flaccid, covered with subpersistent, minute, fasciculate spines, dehiscing by a small, torn apical opening; mass of spores olive, then brown; capillitium dense, forming a conspicuous columella. The base of the peridium is furnished with a number of snow-white strands of mycelium.

Generally densely tufted and connected by numerous white, branching strands. Typically pear-shaped with an umbo, sometimes subglobose.

On rotten wood, also on fallen branches. Common.

*L. cepæforme*.—Peridium subglobose, slightly narrowed at the base and continued as a slender, tapering root, ½–1 in. across, whitish or yellowish; wall thin and papery, minutely scurfy, becoming smooth; mass of spores yellow, then olive, finally brown; capillitium composed of dark-coloured, branched threads.

Our smallest puffball, rarely exceeding ⅔ in. diam.

In pastures, on hedge banks, etc.



## CALVATIA

Peridium wall brittle, the upper portion breaking away irregularly ; sterile base well developed ; capillitium dense, threads long and intermixed.

Readily separated from *Lycoperdon* by the upper portion of the wall breaking away in irregular patches, instead of having a definite apical opening for the escape of the spores.

*C. gigantea* (Pl. XXXV, fig. 4).—Peridium globose or subdepressed, often puckered or plicate at the base, white ; wall thick, somewhat downy, becoming smooth and fragile, breaking away above and leaving a wide, irregular opening ; sterile base spongy ; mass of spores yellow ; then olive, finally brownish olive ; sterile base spongy, sometimes not very evident ; capillitium threads dark-coloured, irregularly branched, long and intertwining.

Size very variable, ranging from 4 in. to a foot in diameter. Specimens are said to have been met with a yard in diameter. When young the flesh is pure white, and at this stage is delicious eating. Gradually the flesh assumes a faint yellow tinge, deepening to canary-yellow, and in the dry powdery condition to a brownish olive-colour.

Among grass in pastures, meadows, etc.

*C. caelata*.—Peridium subglobose or top-shaped, often depressed, covered with large floccose warts, usually split into shreds at the base, upper portion breaking away, leaving only the sterile base remaining ; spore-mass olive ; capillitium composed of stout coloured threads.

Varying from 1–4 in. across ; stem stout, variable, often almost absent.

Fields, roadsides, woods, etc.

*C. saccata*.—Peridium subglobose, usually more or less depressed, sometimes plicate below, with small spinulose warts that become smaller downwards, the upper portion breaking away irregularly ; sterile base well developed, porous, passing downwards into a long, stout, stem-like base ; mass of spores olive, becoming olive-brown or umber ; capillitium dense.

From 2–5 in. high ; peridium thin, becoming smooth. Very large specimens sometimes occur.

Among moss in open woods, etc.

## QUELETIA

Peridium subglobose, without a mouth, the wall breaking up irregularly when mature. Stem elongated, with coarse, spreading squamules.

Somewhat resembling a puffball, on a long, coarsely scaly, stout stem.

*Q. mirabilis*.—Peridium 1–2½ in. across, globose, dingy white ; gleba rusty cinnamon ; stem 3–5 in. long, very stout, tapering upwards, coarsely shaggy, whitish.

An introduced species, native of France. The fungus occurred as an introduced species, on tan, in the United States. These specimens were sent to Kew for determination, and arrived partly in a broken-up condition. The fragments were thrown out under a cedar tree, just outside the herbarium. The following season several fine specimens of *Queletia* appeared under the cedar tree. It has, however, not become established.

### GEASTER

Peridium at first closed, composed of three layers, the two outer generally adhering and splitting from the top into several sharp-pointed portions which spread out ; inner layer sessile or stalked, with one definite mouth or opening at the top, through which the spores escape.

Characterized by the outer portion or exoperidium splitting into portions which spread out in a star-like manner. Differs from *Myriostoma* in having one opening to the endoperidium.

1. *Endoperidium* (inner peridium) *distinctly stalked*.

*G. bryantii*.—Exoperidium brownish, splitting into 7–10 sharp-pointed portions that become recurved and then 1½–3 in. across ; endoperidium subglobose, with a groove round the top of its stalk ; spore-mass dark brown, mouth grooved.

On the ground amongst leaves, etc.

*G. schmideli*.—Exoperidium splitting to the centre into a variable number of acute segments, pale inside ; endoperidium globose-ovate, lead-colour, mouth long, fluted ; spore-mass blackish umber.

On the ground in open places.

*G. berkeleyi*.—Exoperidium splitting into a variable number of portions ; endoperidium broadly ovate, pale brown, papillate or granulated, mouth fluted, surrounded by a smooth, depressed zone.

Differs from *G. limbatus* in the papillose wall of the endoperidium, and from *G. striatus* in the smooth zone surrounding the mouth.

On the ground.

*G. limbatus*.—Exoperidium blackish brown, splitting into many irregular portions ; endoperidium subpyriform ; stalk short, mouth conical, surrounded by a pale silky circle ; spore-mass purple-brown.

On the ground amongst leaves, etc.

*G. fornicatus* (Pl. XXXV, fig. 5).—Exoperidium splitting into 4–5 acute portions, the two layers of which it is composed separating, the outer layer remaining fixed to the ground, concave ; the inner layer becoming convex upwards and fixed to the outer layer



by the tips of the segments only ; endoperidium obpyriform, stalk short, mouth conical, grooved ; spore-mass brown with a purple tinge.

On the ground amongst leaves.

2. *Endoperidium sessile* or very nearly so.

*G. striatus*.—Exoperidium splitting into a variable number of thin portions ; endoperidium globose, surface usually rough with minute projecting points ; mouth conical, fluted ; spore-mass umber.

On the ground.

*G. lageniformis*.—Exoperidium ovate-acuminate, splitting into a variable number of sharp-pointed segments ; endoperidium subglobose, mouth almost flat, silky, surrounded by a silky zone ; spore-mass umber with an olive tinge.

On the ground.

*G. mammosus*.—Exoperidium splitting nearly to the base into a variable number of portions ; endoperidium pale, mouth conical, surrounded by a pale, narrow silky circle ; spore-mass brown with a purple tinge.

The exoperidium is hygroscopic, the segments being strongly incurved when dry, and spreading when wet. Somewhat resembling *G. hygrometricus*, but distinct in the prominent mouth surrounded by a pale silky ring.

On the ground among leaves, etc.

*G. rufescens*.—Exoperidium splitting nearly to the base into a variable number of acute segments, reddish ; endoperidium pale, mouth surrounded by minute, somewhat triangular teeth ; spore-mass blackish brown.

Differs from *G. fimbriatus* by the mouth being bounded by subtriangular teeth.

In woods and pastures.

*G. fimbriatus* (Pl. XXXV, fig. 2).—Exoperidium limp, splitting into a variable number of acute segments ; endoperidium subglobose, mouth nearly flat, silky ; spore-mass blackish umber.

Differs from all other British species in the almost flat, silky mouth without any encircling zone.

On the ground amongst leaves, etc.

*G. hygrometricus*.—Exoperidium splitting into a variable number of acute segments ; endoperidium usually depressed and wrinkled, mouth small, irregular ; spore-mass dark brown.

Exoperidium hygroscopic, segments rigidly incurved over the endoperidium when dry, expanded when moist.

Distinguished from *G. fimbriatus* by the segments of the exoperidium being incurved when dry.

On the ground among fallen leaves, etc.

## MYRIOSTOMA

Agreeing with *Geaster* in every particular, except that there are several mouths or openings in the wall of the endoperidium for the escape of the spores.

The endoperidium resembles the top of a pepper-pot with its many openings.

*M. coliformis* (Pl. XXXV, fig. 1).—Exoperidium splitting into several sharp-pointed portions, 3–4 in. across when expanded; endoperidium globoso-depressed, attached to the exoperidium by several distinct stalks, openings or mouths, several; spore-mass umber.

In sandy places. Very rare.

## TULOSTOMA

Peridium consisting of two layers, the outer one soon disappearing, dehiscing by a small apical opening or mouth; spore-mass powdery, columella absent, capillitium present; stem slender, elongated.

Resembles a minute *Lycoperdon*, with a long, slender stem. Differs by the presence of a loose collar surrounding the apex of the stem.

*T. mammosum* (Pl. XXXVI, fig. 4).—Peridium subglobose, smooth, with a small umbo at the apex which breaks up and forms the mouth; spore-mass dingy cinnamon,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across, whitish, then dingy ochre; stem 1–3 in. high, slender, squamulose, colour of the peridium.

On old walls amongst moss, dry banks, etc. Rare.

## BATTARREA

Universal volva with a central gelatinous stratum; peridium concavo-convex, convex side uppermost, capillitium present, at maturity supported on a long, slender, rigid stem.

*B. phalloides* (Pl. XXXVI, fig. 6).—Peridium splitting in a circumscissile manner; spore-mass powdery, yellowish brown; stem 10–14 in. long and up to  $\frac{2}{3}$  in. thick, hollow, tapering downwards, externally broken up into coarse fibres and surrounded by the loose volva at the base.

The “egg” condition is deeply buried in the ground.

Sandy places and at the base of hollow trees. Very rare and confined to the East of England.

## PHALLOIDEACEÆ

The most highly evolved and differentiated of any family of fungi. As previously stated, two prominent lines of evolution have always been kept in view: the protection of the spore-bearing



## PLATE XXXVI

1. ITHYPHALLUS IMPUDICUS (STINKHORN)
2. SECTION OF " EGG " OR UNEXPANDED STAGE OF FIG. 1
3. MUTINUS CANINUS, IN DIFFERENT STAGES OF DEVELOPMENT
4. TULOSTOMA MAMMOSUM
5. SECTION THROUGH FIG. 4
6. BATARREA PHALLOIDES
7. LYCOPERDON PIRIFORME
8. CLATHRUS CANCELLATUS



PLATE XXXVI.





portion of the fungus from injury against both living enemies and physical dangers ; also the most certain and economical means by which the spores are diffused. Both these ideas are carried out to perfection in the present family. The hymenium or spore-producing portion of the fungus is fully developed and the spores are quite mature, while yet hermetically sealed within the thick-walled gelatinous volva, which itself remains buried in the ground until this process is completed. At this stage the structural elements of the hymenium, the basidia that bore the spores, etc., become resolved into a very strong-smelling, olive-green, viscid mass containing the very minute spores embedded in its substance. The second stage, providing for the dispersion of the spores, now commences. Owing to the sudden elongation of the receptacle or portion bearing the hymenium, the volva is ruptured and the receptacle bearing its mucilaginous, spore-laden mass is elevated into the air. The strong-smelling mucus is as sweet as saccharine to the taste, and is much relished as food by various kinds of flies, who unconsciously disperse the spores, partly by means of the small amount of mucus containing spores that adheres to their feet and proboscides, and it has been proved also that spores, after having passed through the body of a fly, are yet capable of germination. In most instances the sporophore is red or orange in colour, which, combined with the strong, penetrating smell, serve as indications or advertisements to flies as to their whereabouts. After a specimen of *Ithyphallus impudicus* has just emerged from its volva it is usually more or less covered with feasting flies. It is interesting to note that, whereas colour and smell are agents employed by many flowering plants for securing cross-pollination, they are used by certain fungi for securing the dispersion of their spores.

The Phalloidaceæ are essentially a tropical family with less than a dozen outliers in Europe. There are only three British species. Now and again tropical species occur in this country, having been introduced with exotic plants, grain, etc.

#### KEY TO THE GENERA

Pileus free from the stem at the sides ; apex of stem with an opening. *Ithyphallus*.

Pileus grown to the cap throughout ; stem without an opening at the apex. *Mutinus*.

Stem with 4-6 lobes at the apex, bearing the hymenium.

*Lysurus*.

Stem with a flattened disc at its apex, from the margin of which spring a number of spreading lobes or rays. *Aseræ*.

Receptacle bearing the hymenium forming a hollow sphere, the bounding wall consisting of an irregular network. *Clathrus*.



## NOTES ON THE GENERA

## ITHYPHALLUS

This genus, known for a long time under the name of *Phallus*, is distinguished by the pileus or cap being free at the sides, from its supporting stem, from the top of which it is suspended like a loosely fitting thimble on a finger. The stem has an opening or perforation at the apex.

## MUTINUS

This genus was also at one time included in the old, comprehensive genus *Phallus*. It is at once distinguished from *Ithyphallus* by the cap or pileus being firmly attached to the supporting stem throughout its entire length. There is no perforation at the apex of the stem.

## LYSURUS

Volva and stem as in *Ithyphallus*, but the pileus consists of about five elliptical, wrinkled lobes at the apex of the stem, which spread out more or less at maturity and bear the viscid spore-mass on their inner surface. A genus belonging to the southern hemisphere, introduced with grain, etc. It has not become established here.

## ASERÆ

A very beautiful genus belonging to the tropical and subtropical parts of the world. It sometimes appears in hot-houses, having been introduced with exotic plants brought in Wardian cases, etc. There is, as usual, a large volva and an erect stem, from the top of which spread out 4–6 lobes, each narrowing to a point. The mucus containing the spores is produced on the upper surface of the spreading rays or lobes.

The plant almost exactly resembles in general appearance a stalked sea-anemone with its rays extended.

## ITHYPHALLUS

Universal volva egg-shaped, with a long white root before expansion; after its rupture by the growth of the receptacle it remains as a volva composed of three layers, the central one being gelatinous; receptacle elongated, cellular, hollow, perforated at the apex, which is covered by the thimble-like, reticulate pileus.

Distinguished by the thimble-like pileus being free from the stem except at the apex.

*I. impudicus* (Pl. XXXVI, fig. 1) (stinkhorn).—Volva before expansion egg-shaped, white, springy and elastic when pressed; receptacle or stalk cylindric-fusiform, white, pitted, hollow, 5–8 in. high, covered at the apex by the pileus, which is covered externally by an irregular network of raised ribs; this is covered by an evil-smelling, olive-green gluten containing the spores.

The fungus frequently attains to the size of a hen's egg before bursting through the volva, and is often a subject of curiosity and wonder to the uninitiated ; but if it is cut through the centre from top to bottom its whole structure is revealed. When found in the unexpanded or "egg" stage, if kept in a damp box until next day, it will be found fully expanded. It is, however, advisable to open the box in the open air, as the abominable stench is almost overpowering. The best course, perhaps, is to place the "egg" in a tall bottle and cork it up ; then the mature fungus can be examined without experiencing any unpleasant surprise.

The fungus often grows among loose humus, and the pure white, cord-like mycelium, which is tough, can often be followed for yards, spreading in all directions and bearing at intervals plants varying in size from a pea to that of the full-sized "egg" ready for expansion. The greenish gluten in which the spores are immersed is very sweet to the taste, and is much relished by blue-bottles and other flies, who may usually be seen in numbers on and hovering round the pileus. The gluten serves as food for the flies, who in turn deposit the spores here and there, and thus aid in the diffusion of the fungus. The object of the strong smell is to indicate to insects the whereabouts of the fungus.

var. *imperialis*.—Larger than the type. Volva pink ; apical pore with a distinct margin.

This beautiful variety has once been collected in this country at a Y.N.U. Fungus Foray in Yorkshire.

### MUTINUS

Universal volva egg-shaped before expansion, white,  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, remaining after its rupture as a somewhat torn volva, sheathing the base of the elongated, cellular, hollow receptacle ; pileus  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, closely attached to the upper portion of the receptacle, surface wrinkled.

Differs from *Ithyphallus* in the pileus being adnate or grown to the receptacle throughout its length.

*M. caninus* (Pl. XXXVI, fig. 3) (dogs' stinkhorn).—Unexpanded volva egg-shaped, somewhat elastic ; receptacle cylindric-fusiform, hollow, wall with a single row of cavities, pitted externally, white or more or less suffused with rose-colour, 3–4 in. high ; pileus  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, subacute, wrinkled, red, at first covered with olive-green gluten containing the very minute spores.

Distinguished from *Ithyphallus impudicus* by its much smaller size and adnate pileus. It is sometimes quite devoid of smell, at others with a slight odour, but never anything approaching the abominable smell of the stinkhorn.

In woods and bushy places.



*M. bambusinus*.—This is an introduced species that has occurred once on the roots of a bamboo from Java. It bears a general resemblance to *M. caninus* in size and shape, differing in the red pileus occupying nearly half the length of the stem, and in the very offensive smell, which is much more intense than that of *Ithyphallus impudicus*.

#### LYSURUS

Volva ample ; stem erect, hollow, cellular, surmounted by four to six acutely elliptical lobes, wrinkled, and with a central groove on the outside, bearing the mucus containing the spores on their inner surface.

*L. australiensis*.—Volva and stem whitish, apical lobes bearing the hymenium, dingy, 3–4 in. high.

An Australian species. The spawn or mycelium, or the spores, probably introduced along with wheat from that country.

#### ASERCE

Receptacle stipitate, expanded at the apex into a disc, from the margin of which radiate several tapering, straight or curved lobes ; spores contained in the mucus situated on the disc. Volva large.

*A. rubra*.—Volva large, whitish, edge torn into lobes ; stem stout, hollow, white, rosy, or red ; the perforated disc and spreading rays bright red. Stem 1–1½ in. long, spread from tip to tip of the rays, 1½–2 in.

An Australian species, introduced to Kew along with plants. The whole fungus resembles a stalked, red sea-anemone.

#### CLATHRUS

Universal veil at first entirely closed and subterranean, becoming torn into irregular lobes at the apex, due to the growth of the sporophore, and remaining as a volva at the base of the fungus ; sporophore forming a subglobose, hollow network, covered with mucus, including the minute spores.

Distinguished by the peculiar structure of the receptacle or sporophore, which consists of a hollow sphere bounded by stout branches anastomosing to form an irregular network.

*C. cancellatus*.—Volva whitish, with irregular teeth at the margin, thickish ; receptacle 2–5 in. across, branches of the network wrinkled, varying from dingy red or purplish to vermilion, at first covered with dark olive-green mucus containing the very minute spores. Exceedingly foetid.

One of the most beautiful and curious of our fungi, but unfortunately very rare, and confined to the South of England. I once collected a very fine specimen in the pine woods near Bournemouth, and have grown two specimens that were sent to Kew in the “egg” condition, from woods near Haslemere. The one drawback to a

complete enjoyment of the beauties of this quaint fungus is its most abominable smell, which is a very much concentrated edition of that possessed by the common stinkhorn—*Ithyphallus impudicus*. In the “egg” or unexpanded condition it is quite indistinguishable from the “egg” of the stinkhorn fungus.

#### PILACREACEÆ

Minute fungi, resembling miniature drumsticks, head more or less globose, covered with basidia bearing the spores; stem slender.

An anomalous family, the spores are borne laterally on septate basidia, as in the Auriculariaceæ, and the principal distinguishing features are of a microscopic character.

#### PILACRE

Peridium subglobose, stipitate, wall single, soon disappearing and exposing the basidia; stem slender, elongated.

*P. faginea*.—Peridium or head subglobose, whitish with a tinge of brown, up to  $1\frac{1}{2}$  lines across; threads of the gleba wavy or tortuous; stem blackish, rather slender, up to  $\frac{1}{4}$  in. long (spores subglobose, yellowish brown,  $5\ \mu$  diam.).

On rotten beech wood. Gregarious.

*P. petersii*.—Peridium or head subglobose, whitish, 2–3 lines diam.; stem 2–3 lines high, pale-coloured (spores circular, with an umbilicus or depression on one side, brown,  $5\ \mu$  diam.).

On trunks of hornbeam, holly, beech, etc. Gregarious or crowded in large patches, often extending for many inches. Very local in its occurrence, but not uncommon on the trunks of pollarded hornbeams in Epping Forest.

#### Order II.—ASCOMYCETES

The leading structural feature, constant throughout the order, is the production of the spores inside special cells or asci. As a rule, each ascus contains eight spores. There is much greater variety in the structure of the spores in this order than in the Basidiomycetes; although some are minute, colourless, and simple or one-celled, a great many are coloured, large, and are broken up into two or more cells by cross-walls or septa. In some groups the spores are large, and divided into many cells by walls crossing each other at right-angles. The determination of genera and species depends to a very great extent on the structure of the spores, hence microscopic examination is much more essential than it is in the Basidiomycetes, although even in the last-named order, as the student progresses in the study, it will be found that spore structure and measurements will aid to a very material extent in the discrimination of species, and in the case of what are termed critical species, the spores often afford the most certain means of settling a knotty problem.



Certain species are large and snowy, but the great majority are minute, and come under the definition of microscopic fungi. As in the Basidiomycetes, there is in the Ascomycetes a family of subterranean fungi, the Tuberaceæ, which includes the true truffles and their allies. Numerous species, more especially the microscopic ones, are parasitic, and in many instances prove very destructive to cultivated plants. Among such are the species causing apple scab, potato disease, American gooseberry mildew, etc. Comparatively very few are edible, those best known in this country are the morels and their allies, large, fleshy fungi, appearing in the spring or early summer. None are known to be distinctly poisonous but the fungus called ergot, and some few others.

#### KEY TO THE SUB-ORDERS

Hymenium or ascus-producing portion of the fungus fully exposed at maturity. General texture fleshy and soft ; hymenium often brightly coloured. *Discomycetaceæ*.

Hymenium permanently enclosed in a hollow ascophore or perithecium, the spores escaping at maturity through a small opening or mouth. Consistency often hard or carbonaceous. Most frequently black, in some instances brightly coloured. *Pyrenomycetaceæ*.

#### Sub-Order DISCOMYCETACEÆ

In the Discomycetes the ascophore or entire fungus is typically cup-shaped, either sessile or supported on a stem of greater or less length. In the earliest stage the ascophore is usually globose, and as growth proceeds the upper portion gradually expands, first forming a cup-shaped structure, and finally shallowly saucer-shaped, with the extreme edge turned up. In some genera the expansion takes place until the upper surface is quite plane, or even slightly convex, without any trace of an upturned margin. The hymenium consists of myriads of asci, packed closely side by side, their upper or free ends forming the surface of the disc or inside of the cup. When mature, the spores escape through an opening formed at the apex or free end of each ascus. Mixed with the asci are numerous paraphyses, or slender threads not containing spores ; these are usually the same length as the asci, and their tips, along with the tips of the asci, form the surface of the hymenium. As a rule the tips of the paraphyses are swollen or club-shaped, and usually contain some colouring matter, which gives the colour to the disc or hymenium of the fungus. The colour of the hymenium is invariably due to the colour present in the tips of the paraphyses, and is often very bright, crimson, orange, yellow, green, etc. Some species are quite large, but the majority are small, or even minute, yet, when seen under a good pocket lens, or under a low power of the microscope, are certainly the most beautiful of fungi.

Many grow on the ground, a still greater number occur on dead wood, branches, leaves, and dead vegetable matter generally. One family occurs on the dung of various animals, and is remarkable for the beauty of its spores. Finally, certain species are parasitic on plants.

The following families contain species sufficiently large to be recognized in the field.

#### KEY TO THE FAMILIES

Ascophore vertical, with a distinct stem, conical, clavate, subglobose or compressed, fleshy or waxy; surface even, with brain-like folds, or with coarse honeycomb-like depressions. *Helvellaceæ*.

Ascophore cup-shaped, saucer-shaped, or plane, often brightly coloured, either sessile or supported on a more or less elongated stem. *Pezizaceæ*.

#### HELVELLACEÆ

The representatives of this order present a great variety of form and structure. The one common feature is that the hymenium or spore-bearing surface is exposed from the earliest stage, and not gradually revealed by the expansion and straightening out of the edge of the ascophore. The species are stipitate and the distinction between the stem and the ascophore is well marked. Some genera, as *Geoglossum*, *Mitrula*, etc., bear a superficial resemblance to species of *Clavaria*. In the genus *Verpa* the ascophore closely resembles a thimble supported at the top of a long stem. In *Morchella* the species are mostly large, the globose or conical ascophore, furnished on the outside with large, irregularly polygonal pits or depressions, is supported on a stout stem.

#### HELVELLA

Ascophore stipitate, cap irregular, thin, formed of 2-4 drooping lobes, or sometimes almost saddle-shaped, sometimes crisped and irregularly wavy, often more or less attached to the stem for some distance down the sides; under surface scurfy or velvety, sometimes with raised veins; stem elongated, often ribbed or lacunose (spores 1-celled, colourless, elliptical).

This genus connects the *Pezizaceæ* with the *Helvellaceæ*, differing from the former in the disc of the ascophore not being exposed by gradual expansion, and in not being fleshy and succulent.

*H. crispa* (Pl. XXXVIII, fig. 2).—Cap drooping, inflated and lobed, edge wavy, fragile and almost translucent, thin, whitish or tinged yellow, almost smooth,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. across.

*H. ephippium*.—Cap 2-3-lobed, often more or less saddle-shaped, thin, bistre or greyish, under surface downy or scurfy, greyish,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across; stem thin, elastic, even, scurfy, greyish,  $\frac{1}{2}$ – $\frac{2}{3}$  in. high (spores elliptical,  $16$ – $18 \times 10 \mu$ ).



Recognized by its small size and saddle-shaped cap.

On the ground among grass.

*H. elastica*.—Cap free from the stem, drooping, 2-3-lobed, centre depressed, even, whitish, brownish or sooty, almost smooth below, about  $\frac{2}{3}$  in. broad; stem swollen below, tapering upwards, elastic, even or lacunose, velvety or scurfy, colour of the cap, 2-4 in. long (spores  $18-20 \times 10-11 \mu$ ).

On the ground in damp woods.

*H. macropus*.—This species has much in common with *H. elastica*, from which it is distinguished by the cap being rough with small warts on the upper surface (spores  $28-33 \times 11-13 \mu$ ).

On the ground in shady places. Summer and autumn.

*H. crispa*.—Cap drooping, lobed and inflated, soon free from stem at sides, fragile, almost translucent, whitish, 2-3 in. across; stem stout, usually narrowed upwards, with stout anastomosing, raised ribs, enclosing irregular elongated pits or canals, hollow as are also the ribs, 3-4 in. long (spores  $17-18 \times 9-10 \mu$ ).

Known from all other species by the stout, ribbed, lacunose stem. Edible.

On the ground. Autumn.

*H. lacunosa*.—Cap irregular, often inflated and irregularly lobed, lobes drooping and attached to the stem by the under surface, dark grey or blackish grey,  $\frac{3}{4}$ -2 in. across; stem rather stout, variously ribbed or lacunose, 1-2 in. long, pallid (spores  $18-20 \times 10-12 \mu$ ).

Very variable in size, as also in the inflation of the cap and ribbing of the stem. Differs from *H. crispa* in the dark colour of the cap.

On the ground in woods. Summer and autumn.

## VERPA

Ascophore stipitate, campanulate or thimble-shaped, attached to the tip of the stem, and hanging down with the sides free from the stem; stem equal, even or slightly wrinkled, but not ribbed (spores elliptical, 1-celled, colourless).

Closely allied to *Helvella*; distinguished by the ascophore being more regular in form, and more evidently drooping all round the tip of the stem like a thimble loosely poised on a finger.

*V. digitaliformis*.—Ascophore stipitate, campanulate, apex obtuse, wrinkled, umber, pale and slightly downy underneath, substance thin, up to 1 in. high; stem 2-3 in. long, whitish, ornamented with very minute, concentrically arranged scales.

On banks and in woods under shrubs, etc. Spring.

## LEOTIA

Ascophore stipitate, substance fleshy, soft and somewhat gelatinous, orbicular, edge drooping or incurved, free from the stem,

smooth; stem central, elongated (spores elongated, 1-2-celled, colourless).

Distinguished by the subgelatinous consistency of every part of the fungus, and by the cap-like ascophore supported on a central stem.

*L. lubrica*.—Cap irregularly hemispherical, inflated, wavy, edge thick, yellowish olive-green, somewhat gelatinous,  $\frac{1}{2}$ – $\frac{2}{3}$  in. across; stem nearly equal, or more or less inflated below, pulpy inside, then hollow, dingy yellowish and covered with scattered white granules (spores narrowly elliptical,  $22-25 \times 5-6 \mu$ ).

Gregarious or in small clusters.

On the ground in woods. Summer and autumn.

*L. chlorocephala*.—Cap depressed-globose, somewhat translucent, more or less wavy, edge incurved, dark verdigris-green to blackish green, about  $\frac{1}{2}$  in. across; stem almost equal, green, but usually paler than the cap, powdery, often twisted, 2-3 in. long (spores narrowly elliptical, ends pointed,  $17-20 \times 5 \mu$ ).

Tufted. Differs from *L. lubrica* in the green stem.

On the ground.

#### MITROPHORA

Ascophore large, stipitate, conical or bell-shaped, the surface covered with stout anastomosing ribs, enclosing deep, elongated pits; stem stout, elongated, hollow (spores colourless, elliptical, 1-celled).

Allied to *Morchella*, but readily recognized by the lower half of the ascophore being free from the stem.

*M. gigas*.—Cap conical, obtuse, free from the stem at the lower half, edge more or less wavy, ribs stout, deep, more or less longitudinal, branched and anastomosing, enclosing irregular elongated pits, smoky brown or with an olive tinge, 2-3 in. high, 2 in. or more across at the base; stem stout, whitish with minute rusty squamules, often more or less grooved, hollow, 3-5 in. high (spores  $21-24 \times 11-14 \mu$ ).

Known from *M. semilibera* by its larger size, and by the stout, elongated stem being more or less grooved, swollen at the base, and sprinkled with minute rusty squamules.

On the ground, especially in sandy places. Spring.

*M. semilibera*.—Cap bluntly conical, lower portion free from the stem, ribs prominent, more or less longitudinal, forking and anastomosing to form elongated pits, yellowish or dingy tawny, sometimes with an olive tinge, edges of ribs often darker in colour,  $\frac{2}{3}$ –1 in. high; stem hollow, stout, often more or less thickened at the base, whitish or pallid, 2-3 in. high (spores broadly elliptical,  $18-20 \times 12 \mu$ ).

On the ground in woods. Spring.



## MORCHELLA

Ascophore stipitate or sometimes almost sessile, more or less globose or ovate, attached to the stem throughout its length, hollow and continuous with the cavity of the stem, externally with stout, anastomosing ribs enclosing irregular polygonal or elongated pits; stem stout, stuffed or hollow (spores 1-celled, colourless, elliptical).

Differs from *Mitrophora* in the ascophore being attached to the stem throughout its length. From *Gyromitra* in having irregularly polygonal pits instead of brain-like folds on the surface of the ascophore.

*M. esculenta* (Pl. XXXVIII, fig. 8).—Cap globose, ovate or oblong, hollow, ribs stout, forming irregularly polygonal, deep pits, pale dingy yellow, buff, tawny, sometimes tinged olive, 2–3 in. high; stem stout, almost even, hollow or stuffed, whitish,  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long (spores  $19$ – $20 \times 10 \mu$ ).

Variable in size, form, and colour, but known by the cap being attached to the stem throughout its length, and the stout ribs anastomosing to form irregularly polygonal, and not elongated pits. Edible.

On the ground. Spring and early summer.

*M. conica*.—Cap elongated, somewhat conical or almost cylindrical, tip blunt, hollow, the cavity continuous with that of the stem, primary ribs stout, deep, joined by thinner cross-pieces forming elongated, irregular pits, greyish brown or olive-brown, 2–3 in. long; stem cylindrical, whitish, minutely downy, hollow, about 1 in. long (spores  $16$ – $18 \times 8$ – $9 \mu$ ).

Resembling *M. elata* in the longitudinal ribs on the cap, but smaller, and differing in the stem not being scurfy.

On the ground. Edible.

*M. elata*.—Allied to *M. conica*. Cap conical, with thin ribs running from edge to apex and more or less parallel, connected by shallower transverse ribs, pale yellowish brown, 2–3 in. high, sometimes larger; stem stout, hollow, very fragile, whitish, scurfy.

In fir woods. Spring.

*M. crassipes*.—Agreeing with *M. esculenta* in the pits on the surface of the ascophore being irregularly polygonal in form; differing in the very stout stem being much longer than the ascophore.

On the ground. Spring.

## GYROMITRA

Ascophore stipitate, subglobose, inflated and more or less hollow or cavernous, surface variously convolute and gyrose, or with brain-like folds, substance fleshy; stem very stout, short (spores 1-celled, elongated, colourless or nearly so).

Differs from *Helvella* in the hymenophore not being free from the

stem, and from *Morchella* in the surface of the ascophore having brain-like folds instead of pits. The species are amongst the largest of the Discomycetes. All grow on the ground. Some are edible.

*G. gigas*.—Ascophore subglobose, 3–5 in. diameter, cavernous, coarsely lobed or in irregular, wavy, overlapping pleats, colour various, whitish, ochraceous or with a brown or olive tinge; stem 1–1½ in. long and thick, cellular, waxy, whitish, more or less lacunose, almost smooth (spores fusiform,  $28-33 \times 10-12 \mu$ ).

On the ground. Rare.

*G. esculenta*.—Ascophore subglobose, rather depressed, 2–3 in. diameter, irregularly hollow, surface wavy and wrinkled, and attached here and there to the stem, brown; stem 1½–2½ in. high, 1 in. thick, even or more or less lacunose, sometimes narrowed upwards, stuffed, then hollow, whitish, minutely downy (spores colourless, elliptical, ends blunt, 1-celled,  $17-25 \times 9-11 \mu$ ).

Differs from *G. gigas* by its brown colour and smaller, elliptical spores. Edible.

On the ground, sandy or scorched places under conifers, etc.

#### MITRULA

Ascophore stipitate, fleshy, head subglobose, ovate or clavate, even, smooth, attached throughout to the more or less elongated stem (spores narrowly elliptic-fusiform, 1- or more celled, colourless).

Distinguished from *Geoglossum* by the clear colour of the ascophore and colourless spores.

*M. phalloides*.—Ascophore stipitate, becoming hollow, form variable, clavate, subglobose, or ovate, obtuse, often compressed when large, very smooth, entirely attached to the stem, but the lower edge sharply defined and usually with two small notches on opposite sides, ¼–½ in. high, and often almost as broad, yellow or orange-yellow; stem straight or wavy, smooth and with a silky sheen, white or tinged pink or yellow, 1–1½ in. long (spores becoming 2-celled at maturity,  $12-15 \times 3.5-4 \mu$ ).

Usually gregarious or even clustered, soft, quite smooth everywhere.

On decaying leaves in damp places, among *Sphagnum*, etc.

*M. viride*.—Entirely dingy verdigris-green, ascophore cylindrical or clavate, tip blunt, sharply marked off from the stem below, hollow, often compressed, rather slimy when wet, about ⅔ in. long, stem about the same length as the ascophore, thinner, minutely squamulose (spores 1-celled,  $15-17 \times 5 \mu$ ).

On the ground in woods, among moss, decaying leaves, etc.

*M. olivacea*.—Somewhat similar to *M. viride*, but distinguished by its dark olive or purplish colour, becoming blackish green when old. The stem is often yellowish brown.

On the ground among short grass. Gregarious or tufted.



*L. coprinaria*.—Ascophores becoming almost plane, orange-red to scarlet, with a marginal fringe of spine-like, brown hairs, 3–5 lines across (spores 1-celled, colourless, elliptical, smooth,  $17-19 \times 8-9 \mu$ ).

On cow dung. Gregarious. Very common.

*L. stercorea*.—Closely allied to *L. coprinaria*, differing mainly in the presence of stellate hairs on the outside of the ascophore; disc dingy red, sometimes with an orange tinge, marginal hairs long, brown, 1–3 lines across.

On dung of various animals. Common.

#### DASYSCYPHA

Ascophore minute, sessile or nearly so, closed at first, then expanded and nearly plane, thin and delicate in texture, externally and the edge downy or pilose (spores colourless, smooth, continuous (=1-celled) or 2-celled).

Distinguished by the minute ascophore being downy externally and at the edge. The hairs forming the external and marginal down are all of one kind, thin-walled and soft; whereas in *Lachnea*, an allied genus, the hairs springing from the edge of the ascophore are thick-walled, pointed, and bristle-like, and much longer than the rest. The species all grow on plants, and some are destructive parasites.

*D. calycina* (larch canker).—Ascophores gregarious or scattered, narrowed into a short, stout, stem-like base, globose and closed at first, then expanded with the white, downy edge inturned; disc orange-yellow, externally, and the edge white and downy, 1–2 lines across (spores elliptic-fusiform, colourless, smooth, 1-celled,  $18-25 \times 6-8 \mu$ ).

Although quite a minute fungus, this species is introduced on account of its very destructive nature, being a deadly parasite to the larch, which suffers to the extent of many thousands of pounds annually in this country alone. It is practically present in every larch plantation in the country, where it causes canker-like patches on the trunk and branches, and may also be found on dead branches lying on the ground. The cups or ascophores, although small, are rendered conspicuous by the bright orange disc surrounded by a white border. When young the ascophores resemble minute white, downy balls.

#### PEZIZA

Ascophore sessile or narrowed below into a very short stem-like base, fleshy and brittle, subglobose and closed at first, the margin gradually expanding until a cup-shaped or saucer-shaped body is produced, in some species becoming quite plane; disc even, veined or wrinkled, nodulose, etc.; externally warted or scurfy, rarely almost smooth (asci cylindrical, 8-spored).

Most closely allied to *Humaria*, which differs in the minute size of most of the species. At one time the genus *Peziza* included all the cup-shaped fungi, which have now been distributed throughout many genera.

*Peziza*, as at present understood, includes those brittle, cup-shaped fungi of symmetrical form, sessile, and with the outer surface rough or scurfy. Some tone of brown is the prevailing colour. Some species are of considerable size.

*P. vesiculosa* (Pl. XXXVII, fig. 2).—Clustered and often distorted, due to mutual pressure, sessile, but narrowed at the base of the ascophore to a point of attachment; at first globose and closed, then opening by a minute pore, which gradually expands until more or less cup-shaped, edge often split and wavy when old; disc pale brown, even, externally paler and coarsely granular, 1–3 in. across (spores elliptical, colourless, smooth,  $21-24 \times 11-12 \mu$ ).

Flesh watery, thick, brittle, especially at the base, where it readily splits into two layers. Very brittle. Said to be edible; it certainly is not poisonous, but has no special flavour nor aroma.

Usually in dense clusters on manure heaps, richly manured ground, heaps of decaying leaves, etc.

*P. reticulata* (Pl. XXXVII, fig. 3).—Ascophore subsessile, narrowed into a thick stem-like base, depressed and almost closed when young with the edge much incurved, gradually expanding until almost plane except the extreme edge, which remains incurved; disc with raised ribs which anastomose to form an irregular network, reddish brown, externally whitish or brownish white, somewhat mealy, 2–5 in. across, fleshy, brittle (spores smooth, elliptical, colourless,  $23-26 \times 12-13 \mu$ ).

Allied to *P. repanda*, but distinguished from this and every other species by the prominent nodules and anastomosing, raised ribs on the disc.

On the ground. Solitary.

*P. repanda*.—Ascophore subsessile, contracted into a short stem-like base which is often rooting, saucer-shaped, then expanded, the edge often turned under; disc pale or dark brown or umber, becoming more or less wrinkled at the centre, externally whitish and more or less granular, 2–4 in. across (spores elliptical, smooth, colourless,  $18-22 \times 11-12 \mu$ ).

Fleshy, brittle, edge crenulated. Solitary, gregarious or tufted.

On the ground, often in beech woods, also on rotten trunks.

*P. venosa*.—Ascophore sessile or contracted into a short stem-like base, cup-shaped, edge inturned when young, then expanding and the edge more or less spreading, split or lobed, and wavy; disc umber-brown, externally pale and minutely granular; smell strong, nitrous, 1–2 in. across (spores elliptical, smooth, colourless,  $18-24 \times 11-13 \mu$ ).



PLATE XXXVII

1. GROUP OF "GEOPYXIS COCCINEA" ON FALLEN BRANCH
2. CLUSTER OF "PEZIZA VESICULOSA" ON MANURE HEAP
3. "PEZIZA RETICULATA"; GROWS ON THE GROUND
4. "ACETABULA VULGARIS"; ON THE GROUND





PLATE XXXVII.





Distinguished by the strong nitrous smell. The outside of the ascophore usually has raised, anastomosing ribs which radiate from the base.

On damp ground, rubbish heaps, etc.

*P. ampliata*.—Ascophore sessile or substipitate, thin, brittle, at first globose and closed, soon plane, edge often wavy; disc pale ochraceous, often with a tinge of cinnamon, outside pallid, minutely scurfy or almost smooth, 1–1½ in. across (spores elliptical, smooth, colourless, 17–18 × 9–10  $\mu$ ).

Known by the pale colour, brittle texture, becoming plane, and habitat.

On decaying wood and bark of various trees.

*P. badia*.—Ascophore narrowed into a very short, stout, stem-like base, subglobose and closed at first, then cup-shaped, edge entire or nearly so, wavy; disc dark brown, externally paler and minutely granular, 1–2 in. across (spores elliptical, colourless, minutely warted, 15–19 × 9–10  $\mu$ ).

Readily recognized by the bay or umber-brown disc and the warted spores.

On the ground amongst grass, scorched places, etc.

*P. succosa*.—Ascophore hemispherical, then cup-shaped; disc pale yellowish brown, externally paler and minutely scurfy; the flesh, when broken, exudes a yellow juice, up to 1 in. across (spores elliptical, colourless, minutely warted).

Known by the liberation of a yellowish juice when broken.

On the ground in woods.

*P. saniosa*.—A small species of a purplish brown or violet-colour, giving off a violet-coloured juice when broken.

On the ground and on old trunks in damp places.

#### GEOPYXIS

Ascophore stipitate, rather fleshy, closed at first, then becoming cup-shaped or nearly plane, externally downy, scurfy or smooth; stem usually somewhat slender, sometimes rooting, not grooved nor lacunose, but even.

The leading features of this genus are the comparatively large ascophore, stem round and even. *Sclerotina* differs in the brown colour of every part, glabrous ascophore, and in the slender stem springing from a sclerotium. *Acetabula* differs in the stout, grooved or lacunose stem. *Peziza* differs in the sessile or stalkless ascophore.

*G. coccinea* (Pl. XXXVII, fig. 1).—Ascophore subglobose and closed at first, then expanded and cup-shaped or saucer-shaped, edge entire; disc clear deep carmine, externally whitish or with just a tinge of pink, downy, 1–1½ in. across; stem whitish, downy,



$\frac{1}{2}$ – $\frac{3}{4}$  in. long (spores elliptic-oblong, colourless, smooth,  $25\text{--}30 \times 8\text{--}9 \mu$ ).

Readily known among the large, stalked *Pezizæ* by the brilliantly coloured disc with an entire edge and the whitish outside and stem. One of the most beautiful of our indigenous fungi, and not by any means uncommon, but often passes unobserved as it is in perfection during late winter and early spring. It is collected in the woods in the district of Scarborough, and sold, along with a setting of moss, as a table decoration.

On fallen sticks, more especially hazel, among moss in damp woods.

var. *lactea*.—Ascophore entirely white or cream-colour. On fallen branches. Rare.

#### SEPULTARIA

Ascophore large, sessile, subterranean, globose, completely closed when young; during growth the apex is ruptured into a number of triangular, pointed teeth, exposing the disc, and the fungus becomes slightly raised out of the soil. The outside of the fungus is often covered with matted hairs, but is in some species almost smooth (spores colourless, elliptical).

Distinguished from *Peziza* by being subterranean and by opening at the apex in a stellate manner, hence the edge is broken up into irregularly triangular, pointed teeth. Colour dingy.

*S. sepulta*.—Ascophore at first subterranean, becoming more or less exposed at maturity, depressed-globose and entirely closed at first, then showing a small aperture at the apex, finally splitting into more or less irregularly triangular teeth, yellowish brown or dingy, outside densely downy and more or less coated with sand, 1–2 in. across (spores colourless, elliptical, smooth).

On the ground in woods, among leaves, etc. Not uncommon, but somewhat difficult to find on account of its dull colour.

*S. sumneriana*.—Bearing a general resemblance to *S. sepulta*, but readily distinguished by its differently shaped spores. The ascophore is usually also larger (spores fusiform or spindle-shaped, with pointed ends,  $25\text{--}30 \times 11\text{--}13 \mu$ ).

In the ground, generally under conifers. Appearing in the spring.

#### OTIDEA

Ascophore very shortly stipitate or sessile, large, fleshy or somewhat leathery, elongated and hare's-ear-shaped or irregularly contorted and often clustered, outside scurfy or downy (spores 1-celled, colourless, elliptical).

Characterized by the irregular form of the ascophore; in some species it is erect and more or less resembles in form the ear of a hare or a rabbit; in others it is cup or saucer-shaped, generally

speaking, but very much twisted or contorted, and in such cases the ascophores are as a rule clustered or crowded together.

*O. leporina*.—Ascophore varying from obliquely cup-shaped to rabbit-ear-shaped, divided to the base on one side, edge usually more or less incurved, narrowed below into a short stem-like base, dingy pale ochraceous or washleather-colour, the disc often a shade darker than the outside, 1–3 in. high and broad (spores elliptical, colourless, smooth,  $12-15 \times 7-8 \mu$ ).

The disc is sometimes slightly wrinkled.

On the ground in woods among leaves, etc.

*O. onotica*.—Ascophore very variable in form, usually rabbit-ear-shaped, but sometimes almost cup-shaped and entire, narrowed below into a short, wrinkled, stem-like base; disc pale orange, usually with a tinge of rose-colour, outside pale tawny orange,  $1\frac{1}{2}$ –3 in. high, up to 2 in. across (spores smooth, colourless, elliptical,  $10-14 \times 6-8 \mu$ ).

Differs from *O. leporina* in the brighter colour of the ascophore, and from *O. aurantia* in the smooth spores.

On the ground in woods, among leaves, etc.

*O. aurantia*.—Ascophore sessile, clustered, irregular in shape, much contorted and plicate, or growing singly and more or less regular in outline and saucer-shaped, often becoming almost plane, thin, brittle; disc deep clear orange, or sometimes orange-red, outside paler, sometimes almost white, 1–2½ in. across (spores 1-celled, elliptical, colourless, at first smooth, then covered with a delicate network of raised ribs,  $15-16 \times 7-8 \mu$ ).

Sometimes much crowded, with the edge raised and very much waved and more or less incised, at others scattered, smaller, almost or quite symmetrical in form, and finally spread flat on the ground, very brittle. Easily known by the large size, bright orange disc, pale, downy outside, and the netted spores.

On the ground, often near stumps or among chips.

var. *stipitata*.—Disc bright scarlet; stem more or less elongated. Small.

var. *atromarginata*.—Disc blood-red, wrinkled, edge black; spores warted, up to 1 in. across.

*O. luteo-nitens* (Pl. XXXVIII, fig. 7).—Ascophore globose at first, then expanding until more or less plane, wavy and irregular in outline; disc varying from bright orange-yellow to primrose-yellow, externally paler, edge almost smooth,  $\frac{1}{4}$ –½ in. across, but size variable (spores colourless, elliptical, smooth for some time, then becoming minutely warted,  $12-13 \times 6-7 \mu$ ).

Gregarious or sometimes crowded. Differs from *O. aurantia* in its smaller size.

On bare ground in damp places.



## RHIZINA

Ascophore sessile, expanded from the first, more or less plane, attached by numerous root-like fibrils springing from the whole of the under surface (spores fusiform, colourless, 1-celled).

Known by the crust-like ascophore attached to the substratum by numerous tufts of fibrils.

*R. inflata*.—Crust-like, flattened generally, more or less convex, wavy or nodulose, bay-brown or umber, edge slightly raised and paler, thick, fleshy, irregularly orbicular or often lobed; spores 1-celled, fusiform, colourless or with a tinge of brown at maturity, smooth,  $32-36 \times 9-10 \mu$ ).

On sandy soil that has been burnt, peaty ground, heaps of sawdust, etc. Said to be parasitic on the roots of trees.

## Sub-Order PYRENOMYCETACEÆ

Some of the families constituting this very extensive group of fungi include species that are of comparatively large size. *Daldinia*, a smooth, subglobose fungus of a pitch-black colour, is not uncommon on old wood. When cut open, the dusky, solid interior is seen to be marked with concentric lines or rings. The entire fungus varies from 1-2 in. in diameter. If the circumference of a section of *Daldinia* is examined with a pocket lens, it will be seen to be studded with minute subglobose or flask-shaped cavities. These flask-shaped bodies or perithecia contain the asci that produce the spores; each perithecium has an opening or mouth at its summit, through which the spores escape at maturity. The mouth of each perithecium opens at the surface of the fungus. If the surface of a *Daldinia* is examined under a pocket lens, its apparently smooth and even surface is seen to be studded with myriads of very minute pinprick-like markings, each of which corresponds to the mouth or opening of a perithecium. If a mature specimen of *Daldinia* is placed on a piece of white paper and covered over with a tumbler and left till next day, the surface of the fungus and the surrounding paper will be found covered with a black, sooty powder, which on examination under a microscope will prove to consist of innumerable elliptical, dark brown spores, as seen by transmitted light, but which appear black in the mass.

If the foregoing description has been grasped, it will be seen that the spore-bearing portion of the fungus is confined to the periphery, the remainder of the solid mass being sterile, and called the stroma.

The genus *Xylaria* is, perhaps, more commonly distributed than *Daldinia*; in fact, it would be almost inconceivable for anyone to collect fungi for an hour in a wood, where stumps or fallen branches abound, without coming across specimens of the "candle-snuff fungus" (*Xylaria hypoxylon*, Pl. XXXVIII, fig. 1). *X. polymorpha* (Pl. XXXVIII, fig. 9), although perhaps not so abundant as

*X. hypoxylon*, is fairly abundant on old stumps and logs ; it usually grows in clusters ; the black, irregularly club-shaped ascophores vary from 2–3 in. in length, and often exceed  $\frac{1}{2}$  in. in thickness near the tip. If in a mature condition, the surface is corrugated or rough, due to the slightly projecting mouths of the perithecia. If a section is made of one of the clubs, the periphery is seen to be crowded with flask-shaped perithecia ; the substance of the stroma or fleshy, central portion is white and fibrous. A very thin section of the peripheral portion, when examined under a microscope with a magnification of about three hundred diameters, will show the flask-shaped perithecia with the mouth opening outwards to the circumference of the fungus and containing asci, each containing eight dark brown, obliquely elliptical, 1-celled spores, arranged in a single row.

So far we have been dealing with species of Pyrenomycetes that have numerous perithecia embedded in a more or less fleshy substance, the stroma ; but there are myriads of species where no stroma or sterile portion is present. In such cases the minute perithecia are either collected in groups, but entirely free from each other, or they may be scattered singly. Such species are truly microscopic fungi, and occur as minute black points projecting from dead wood, herbaceous stems, leaves, etc. If the student is desirous of becoming acquainted with this minute but interesting group of fungi, it is only necessary to examine the lowest portion of dead nettle, thistle, or burdock stems, when in ninety-nine times out of a hundred reddish stains will be found, and on closer examination the minute black perithecia will be seen half buried in the stem. Microscopic examination of a thin slice or section taken through the fungus and the matrix it is growing upon will alone reveal the entire structure.

#### TUBERACEÆ

The species belonging to this family grow underground, and are consequently almost or entirely unknown to the majority of mycologists, although several of the species are by no means uncommon in this country. The different species vary considerably in size, some being not larger than peas, whereas others are as large as a good-sized potato, and, generally speaking, they more or less resemble medium-sized or small potatoes in appearance. Some are globose, others variously warted or lobed ; the wall varies in colour from white, pale brown, rusty olive or blackish, and the surface may be quite smooth, minutely wrinkled or warted, or covered with large pyramidal warts. The entire structure or tuber is termed the *ascophore*, and the central portion is the *gleba*, which often presents a more or less marbled appearance, or resembling a section of a nutmeg ; the paler lines, called *dissepiments*, which are often much branched and wavy, correspond in structure and func-



tion to the gills of agarics, and bear the basidia. Nearly all the species are strong-scented, the smell in some instances being very agreeable, that is, from the human standpoint, as in the edible truffles; in other examples the smell is very strong and nauseous, especially when the fungus is mature. Growing underground and entirely lacking the usual methods for effecting the dispersion of the spores, the truffles are eaten by various animals, more especially rodents, and by this means the spores, which do not suffer in passing through the alimentary canal of an animal, are dispersed. The strong smell exuded at maturity is for the purpose of indicating to animals the whereabouts of the subterranean fungi. Dogs and pigs are trained to hunt for truffles, being guided by the strong smell emitted by the fungus.

The most highly prized edible species, or truffles, are included in the genus *Tuber*. Our best native species is *Tuber æstivum*, which occurs in fair quantity in a few districts, more especially under beeches on Salisbury Plain. The neighbourhood of Patching, near Arundel, Sussex, was at one time noted for its fine truffles.

#### TUBERACEÆ

Ascophore subterranean, subglobose or irregular in form, wall fleshy or leathery, continuous or variously perforated; asci containing 1-8 spores; spores 1-celled.

#### KEY TO THE FAMILIES

Gleba breaking up into a blackish powdery mass of spores at maturity. 1. *Elaphomycetææ*.

Gleba not becoming powdery, but becoming lacunose or cavernose owing to the persisting walls of the gleba. 2. *Tuberææ*.

#### 1. ELAPHOMYCETEÆ

##### ELAPHOMYCES

Ascophore irregularly subglobose or depressed, wall thick and firm; asci subglobose; spores coloured, forming a blackish dusty mass when mature.

This is the only genus included in the family Elaphomycetææ, and is distinguished by the early disappearance of the dissepiments of the gleba and the walls of the asci, the spores filling the cavity of the fungus with a blackish dusty mass at maturity.

*E. anthracinus*.—Ascophore subglobose, blackish brown, firm and hard, minutely wrinkled, up to  $1\frac{1}{2}$  in. diam.; mycelium usually abundant, brownish; asci subglobose; spores globose, minutely wrinkled, blackish brown and opaque,  $16-20\ \mu$  diam., mixed with fine cobweb-like threads.

Smell weak, somewhat resembling radishes.

In stiff soil under trees. Rare.

*E. variegatus*.—Ascophore subglobose, wall thick and hard, golden or ochraceous, sometimes brownish, densely covered with small pointed, pyramidal warts, 1–2 in. diam.; asci subglobose, 1–4-spored; spores globose, blackish brown, often with a violet tinge in the mass, opaque, rather coarsely wrinkled, 16–21  $\mu$  diam., mixed with cobweb-like threads.

Distinguished from *E. granulatus* by the pointed, pyramidal, four-sided warts covering the outer wall, and by the streaked or marbled flesh of the wall. Mycelium yellowish, scanty. Smell variable in intensity, sometimes quite weak, at other times like burnt hoof. *Claviceps ophioglossoides* is often parasitic on this fungus.

Under trees in woods.

*E. granulatus*.—Ascophore subglobose or ellipsoid, when large sometimes grooved or nodulose, wall firm, yellow, then tawny or brownish, densely covered with minute rounded warts, 1–3 in. diam.; mycelium yellow, soon disappearing; asci subglobose, 1–8-spored; spores globose, blackish brown, with a tinge of purple in the mass, opaque, 20–30  $\mu$  diam., mixed in the gleba with a dense mass of fine silky capillitium threads.

Our commonest species, but not generally met with on account of its subterranean habitat, unless specially searched for. Its presence is often betrayed by *Claviceps capitata*, which is parasitic upon it, and appears above ground under the form of yellowish brown, miniature drumsticks.

On the ground under conifers, on the roots of which it is said to be parasitic or to form mycorrhiza. Smell generally weak, sometimes pungent.

*E. leucosporus*.—Ascophore irregularly globose, usually deeply umbilicate or with a depression at the base, wall thin, blackish brown, smooth, about  $\frac{1}{4}$  in. diam.; mycelium scanty, greenish; spores globose, minutely wrinkled, at first colourless, then becoming blackish brown and almost opaque, with a tinge of purple in the mass, 15–20  $\mu$  diam., mixed with colourless, cobweb-like capillitium threads.

The species was first described from an immature specimen having the spores, yet colourless, hence the specific name *leucosporus* or white-spored. Fortunately the specimen from which the fungus was first described was kept, and it was found that eventually the spores became blackish brown. Moral: always preserve specimens that new species are founded upon, commonly called type specimens.

Smell weak and fugacious.

Under oaks. Very rare.



## TUBEREÆ

## KEY TO THE GENERA

A. *Gleba without veins, but having one or more cavities.*

\* *Asci cylindrical.*

Spores warted, subglobose.

*Genea.*

\*\* *Asci broadly oblong or subglobose.*

Spores elongated, smooth.

*Balsamia.*

Spores globose, surface netted.

*Hydnobolites.*

Spores globose, warted.

*Hydnotrya.*

B. *Gleba with permanent veins (dissepiments), solid or lacunose.*

Spores globose, smooth ; asci cylindrical.

*Stephensia.*

Spores globose, warted ; asci elliptic-oblong.

*Pachyphlæus.*

Spores elliptical or globose, netted, warted or spiny ; asci subglobose.

*Tuber.*

Spores globose with elongated, blunt warts ; asci elliptic-oblong.

*Chæromyces.*

Ascophore with a distinct obconic base ; spores globose, warted ; asci subglobose.

*Terfezia.*

Spores globose, hyaline, with long, very slender, spreading spines.

*Amylocarpus.*

## GENEA

Ascophore fleshy, warted, with a perforation in the wall at the apex, and a tuft of mycelium at its base ; gleba broken up into cavities opening into the apical perforation ; asci cylindrical, 8-spored ; spores subglobose, colourless.

*G. verrucosa*.—Ascophore irregularly lobed or grooved, black, minutely warted, apical opening often large, up to  $\frac{1}{2}$  in. across ; asci narrowly elliptical, 8-spored ; spores globose or broadly elliptical, colourless, warted,  $25 \times 20 \mu$ , or  $25 \times 30 \mu$ .

Smell strong, unpleasant.

Clay soil under oaks, chestnuts, etc.

*G. klotzschii*.—Ascophore irregular in form, black, warted, attached by black fibrils ; mycelium abundant, white, floccose, about  $\frac{2}{3}$  in. diam. ; asci cylindrical, 8-spored ; spores subglobose, colourless, rather coarsely warted,  $25\text{--}30 \mu$  diam.

Growing nearly on the surface of the soil in small groups, and covered by a dense patch of white mycelium running over the surface. Smell foetid.

*G. hispidula*.—Ascophore subglobose, densely covered with long, bright brown hairs, apical opening almost hidden, up to  $\frac{1}{2}$  in. diam. ; asci cylindrical, 8-spored ; spores globose or broadly elliptical,  $25\text{--}30 \times 20\text{--}25 \mu$ , or  $20\text{--}26 \mu$  diam.

The internal cavity is often almost simple. Smell faint.

Underground under chestnut trees.

## BALSAMIA

Ascophore not perforated, rather soft, cavernose ; asci elliptic-oblong or subglobose, 8-spored ; spores elliptic-oblong, smooth, colourless.

*B. vulgaris*.—Ascophore irregularly shaped, very minutely warted or almost smooth, dark-coloured,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. diam., cavities large, wavy ; asci ovate-oblong ; spores cylindric-oblong, smooth, colourless,  $25\text{--}35 \times 9\text{--}12 \mu$ .

Smell very strong and unpleasant.

Under trees. Rare.

*B. platyspora*.—Ascophore irregularly subglobose, minutely warted, yellowish, warts darker, internal cavities minute, about  $\frac{2}{3}$  in. diam. ; asci oblong-ovate ; spores elliptic-oblong, smooth, colourless,  $24\text{--}30 \times 8\text{--}11 \mu$ .

Under trees and bushes.

*B. jagiformis*.—Ascophore globose, densely covered with fine warts, dusky brown or rusty, cavities crowded,  $\frac{1}{2}$ –1 in. across ; asci ovate-oblong ; spores elliptic-oblong, colourless,  $16\text{--}20 \times 10\text{--}11 \mu$ .

In clay soil. Smell very strong. Rare.

## HYDNOBOLITES

Ascophore fleshy, wrinkled or folded, cells wavy, opening to the surface ; asci elliptic-oblong, 8-spored ; spores globose, surface netted or reticulated.

*H. cerebriiformis*.—Ascophore subglobose, wrinkled, especially below, at first covered with whitish down, soon smooth and pale yellow,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. diam. ; asci elliptic-oblong ; spores globose, netted, tinged yellow,  $18\text{--}30 \mu$  diam.

The ascophore is covered with wrinkled folds resembling a brain.

Fixed to the ground by mycelium, under moss or fallen leaves in woods.

## HYDNOTRYA

Ascophore perforated, minutely warted or velvety, cavities of the gleba wavy, often opening to the surface ; asci elliptic-oblong ; spores globose.

*H. tulasnei*.—Ascophore globoso-depressed, base wrinkled, with perforations, minutely velvety, rufous,  $1\text{--}2\frac{1}{2}$  in. diam. ; asci elliptic-oblong ; spores globose, brown, coarsely warted,  $25\text{--}35 \mu$  diam.

The ascophore is some shade of rusty brown, often tinged vermillion. Smell weak.

Sandy soil.

## STEPHENSIA

Ascophore irregularly globose and more or less depressed ; gleba



with wavy veins, becoming cavernous, deliquescent; asci cylindrical, 8-spored; spores globose, smooth, colourless.

*S. bombycina*.—Ascophore subglobose, depressed, often very irregular, indented at the base, rather soft, minutely downy, whitish or with a yellow tinge, 1–3 in. across; gleba whitish with yellow septa or walls; asci cylindrical, 8-spored; spores smooth, globose, colourless, 18–23  $\mu$  diam.

Smell pleasant at first, becoming very disagreeable and strong when old.

Underground under trees.

#### PACHYPHLÆUS

Ascophore fleshy, often warted, with a more or less well-defined apical opening, base distinct; gleba with wavy dissepiments; asci ovate-oblong, 8-spored; spores globose, coloured, warted.

*P. melanoxanthus*.—Ascophore subglobose, warted, with a distinct base, yellowish green, then blackish, opening apical or lateral,  $\frac{1}{2}$ –2 in. diam.; gleba olive-yellow, then dusky and with broad, black lines; asci 8-spored; spores coloured, globose, warted, 14–17  $\mu$  diam.

Smell weak when young, becoming strong and nauseous.

Among humus in oak and beech woods, sometimes attached to twigs and dead leaves lying above ground.

*P. citrinus*.—Ascophore subglobose, minutely warted, brown and powdered with yellow granules, apical opening bright yellow, base rooting, up to 1 in. broad; gleba lemon-yellow; asci narrowly ovate-oblong, 8-spored; spores globose, coloured, minutely warted, 13–14  $\mu$  diam.

Differs from *P. melanoxanthus* in the thinner and much more finely warted wall of the ascophore, which is clear yellow when young; also in the more finely warted spores.

Smell strong, said to resemble decaying seaweed.

Underground in woods.

*P. conglomeratus*.—Ascophore irregularly nodulose and plicate, as if consisting of several distinct individuals joined together; lobes rounded, smooth, deep rufous brown or olive-brown, the sunken portions with yellow fibres, up to 1½ in. diam.; asci broadly oblong-ovate, 8-spored; spores globose, coloured, with scattered warts, 16–19  $\mu$  diam.

Distinguished by the much-lobed ascophore, which has a short stem-like base.

Underground in woods.

#### TUBER

Ascophore irregularly globose, without a distinct rooting base, fleshy or sometimes becoming almost woody, surface smooth, downy or warted; gleba presenting a marbled appearance, due to

the dissepiments ; asci broadly elliptical or globose ; spores coloured, smooth or variously ornamented on the wall.

\* *Wall of spores reticulated or covered with a network of raised ribs.*

*T. æstivum*.—Ascophore irregularly globose, blackish brown, covered with large, hard, pyramidal or 4-sided warts, often indented at the base, 1–4 in. diam. ; gleba whitish, then brown, dissepiments numerous, much branched and wavy ; spores elliptical or subglobose, netted with a rather large, shallow mesh,  $40\text{--}60 \times 30\text{--}40 \mu$ , or  $30\text{--}40 \mu$  diam.

Distinguished by the coarsely warted ascophore and the large spores ornamented with a large, shallow network. Perhaps the best of our edible truffles, but much inferior to the exotic Périgord truffle, *T. melanosporum*. Taste somewhat insipid ; smell somewhat resembling that of beer yeast.

Underground in woods, especially under beeches ; just below the surface, or sometimes above ground under heaps of dead leaves, etc.

*T. bituminatum*.—Ascophore globose or ovate, regular, blackish, and covered with small many-sided, pyramidal warts, 1–3 in. diam. ; gleba with the dissepiments mostly radiating from the base ; asci subglobose, with long stalks ; spores globose or broadly elliptical, translucent brown, with a large large-meshed, shallow network,  $40\text{--}50 \mu$ , or  $45 \times 60 \mu$ . Smell strong, like horse-radish.

Most nearly allied to *T. mesentericum*, differing in its larger spores and less wavy dissepiments. Differs from *T. æstivum* in its strong smell and smaller warts on the wall of the ascophore.

Usually deeply buried in sand.

*T. fætidum*.—Ascophore irregularly globose, variously lobed or nodulose, smooth or sometimes minutely wrinkled, brownish,  $\frac{1}{2}\text{--}1\frac{1}{2}$  in. diam. ; gleba whitish, then reddish brown, dissepiments whitish, much branched and anastomosing ; spores with a rather small-meshed, shallow network,  $27\text{--}36 \times 20\text{--}30 \mu$ .

Smell and taste resembling rancid oil, with a suggestion of onions. Subterranean under trees.

*T. macrosporum*.—Ascophore subglobose, sometimes nodulose, often cracked, densely covered with minute flattened warts, blackish and spotted with rusty brown,  $\frac{3}{4}\text{--}2$  in. across ; gleba at first white, changing to purplish brown or blackish, dissepiments numerous, mixed with finer dusky lines ; asci subglobose ; spores elliptical, brown, with a small-meshed, shallow network,  $50\text{--}65 \times 35\text{--}40 \mu$ .

Smell strong, like onions. Readily known by the large elliptical spores.

Underground, usually in clay soil, under oaks, willows, poplars, etc.

*T. excavatum*.—Ascophore subglobose or irregularly shaped with a basal indentation, ochraceous, minutely wrinkled,  $\frac{1}{2}\text{--}1$  in. diam. ; gleba tinged ochraceous, dissepiments white, radiating from the



sunken-in base, hard when dry; asci elliptical to subglobose; spores elliptical or subglobose, with a large-meshed, deep network, yellowish brown,  $35-53 \times 30-40 \mu$ .

Readily known by the minutely wrinkled or warted ascophore having a deep depression at the base. Smell strong, resembling radishes.

Underground in woods.

*T. dryophilum*.—Ascophore globose, usually regular in form, even, at first white and downy, becoming smooth and brownish violet, variegated with violet,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. diam.; gleba reddish brown or purple-brown, with whitish dissepiments springing from various parts of the wall; asci 2–4-spored; spores broadly elliptical, orange-brown, netted, mesh rather large and deep,  $40-45 \times 20-30 \mu$ .

Known by the even wall of the ascophore, purplish gleba, and large elliptical spores. Smell weak, not unpleasant.

Underground under oaks and poplars.

*T. rapæodorum*.—Ascophore globose or irregular in shape, smooth, tinged yellow with whitish spots corresponding in position to the dissepiments in the gleba,  $\frac{1}{2}$ –1 in. diam.; gleba white, then brownish with a few white dissepiments; asci subglobose or obovate, with 1–4 spores; spores elliptical, netted, mesh large and somewhat elongated in the direction of the long axis of the spore, shallow,  $35-55 \times 24-30 \mu$ .

Smell strong, resembling radishes. The size of the spores varies considerably, depending on the number present in an ascus.

In sandy soil under trees.

*T. puberulum*.—Ascophore subglobose, somewhat lobed, pinkish brown, covered with short, erect down, often cracked,  $\frac{2}{3}$ –2 in. diam.; gleba with whitish dissepiments radiating from the base; asci subglobose; spores globose or subglobose, orange-brown, netted, mesh not very large, but deep,  $35-45 \mu$  diam.

Clearly distinguished by the downy surface of the ascophore, through which the pinkish brown colour shows.

In sandy ground.

**\*\* Wall of spores warted or spinulose.**

*T. brumale*.—Ascophore subglobose, generally regular in outline, reddish violet, then black, rough with polygonal warts having the apex excavated and crested with points, 1–4 in. diam.; gleba greyish black with a violet tinge, traversed by branched, whitish dissepiments; asci numerous, subglobose or broadly elliptical, 3–6-spored; spores elliptical or elliptic-oblong, yellowish brown, spinulose; spines slender,  $20-30 \times 15-20 \mu$ .

Known amongst species with spinulose spores by the large polygonal warts on the wall of the ascophore. Edible. Smell strong. Sometimes larger than the measurements given.

Underground under trees, etc.

*T. rufum*.—Ascophore subglobose or irregular in form, minutely warted, cracked, rusty brown, 1–2½ in. diam. ; gleba reddish brown when mature, dissepiments whitish, then livid, mixed with tawny lines ; asci broadly ovate, 1–4-spored ; spores broadly elliptical or nearly globose, brown, densely covered with short, slender spines, 25–36 × 17–24  $\mu$ .

Wall of ascophore thick and somewhat cartilaginous, colour variable, but always with a rusty tinge. Smell variable, sometimes nauseous. Sometimes there is only one spore in an ascus, which is then very large.

In woods. Underground or partly exposed.

*T. scleroneuron*.—Subglobose and somewhat lobed, as a rule minutely warted or almost smooth, cracked, reddish brown, 1–2 in. diam. ; gleba greyish at the centre, changing into reddish brown towards the wall ; asci broadly ovate or clavate, 2–4, usually 3-spored ; spores subglobose or broadly elliptical, densely covered with slender spines, 4–6  $\mu$  long, 17–23 × 25  $\mu$ .

Distinguished from *T. rufum* by the deep red-brown colour of the wall of the ascophore, by the broadly elliptical spores, and faint aromatic smell. When dry the fungus becomes as hard as wood.

Underground. Rare.

*T. nitidum*.—Ascophore globose or somewhat depressed, hard, smooth, shining, with a tinge of reddish yellow, ½–1½ in. diam. ; gleba white, then reddish brown, hard, the white dissepiments springing from a pale point at the base ; asci 2–4-spored ; spores broadly elliptical or subglobose, yellowish brown, densely covered with rather long, slender spines, 20–30 × 15–24  $\mu$ , or 20–25  $\mu$  diam.

Distinguished by the even, polished wall of the ascophore and the small spinulose spores.

Underground under trees.

*T. ferrugineum*.—Ascophore irregular in shape, very soft, rusty brown, minutely warted, often more or less cracked, 1–3 in. diam. ; gleba soft, dry, granular, pale rusty brown with a few branched, whitish dissepiments ; asci numerous, 2–4-spored ; spores from elliptical to globose, brown, with a dense covering of slender spines, 18–25 × 15–18  $\mu$ .

Distinguished by the very soft ascophore. Hard when dry. Smell rather strong.

Underground.

#### CHÆROMYCES

Ascophore without any opening to the outside, even, with a distinct basal portion, wall often cracked ; gleba traversed by numerous thin, branched lines ; asci oblong-ovate, 8-spored ; spores globose, warted.



*C. meandriiformis*.—Ascophore irregularly globose, often nodulose or irregular in form, pale yellowish brown, becoming much cracked up into irregular patches, interstices whitish, base plicate or puckered,  $2\frac{1}{2}$ –5 in. diam. ; flesh white, then yellowish ; gleba traversed by numerous thin, ochraceous lines ; asci ovate or oblong-ovate, 8-spored ; spores globose, with numerous rather long, blunt warts or spines,  $21$ – $26\ \mu$  diam., including the spines.

Smell strong. Often reaches to a large size.

On the ground, often more or less exposed.

#### TERFEZIA

Ascophore subglobose or irregular in form, with a distinct short, obconic, stem-like base, wall not perforated ; gleba fleshy, sterile basal portion areolate, pale ; asci globose or subglobose, often 8-spored ; spores globose, warted, spinulose or netted.

*T. leonis*.—Ascophore subglobose or pear-shaped, often very large, with a short, obconic, stem-like base, whitish, stained and discoloured when old, 2–5 in. diam. ; asci large, subglobose, 8-spored ; spores globose, coarsely warted, for a long time colourless, then slightly coloured,  $19$ – $25\ \mu$  diam.

Very variable in size. Smell weak, unpleasant.

Subterranean or partly exposed. Not uncommon in the New Forest, where I have collected several fine specimens at different times in the neighbourhood of Lyndhurst.

#### AMYLOCARPUS

Ascophore globoso-depressed, minute, soft and fleshy, surface more or less wrinkled or convoluted ; asci elliptical, soon deliquescing ; spores globose, colourless, with long, scattered, slender spines.

*A. encephaloides*.—Ascophore globoso-depressed, with wavy, brain-like folds, fleshy, pale dull yellow, 1–2 lines diam. ; asci elliptical or broadly clavate, soon deliquescing ; spores globose, colourless, with very slender, scattered spines as long as the diameter of the spore,  $10$ – $12\ \mu$  diam., excluding the spines.

Bearing a strong superficial resemblance to *Dacryomyces deliquescens*.

Very rare. Only once found, growing in groups on fragments of wood on sand by the seashore at Sketty, near Swansea.

#### SPHÆRIACEÆ

##### HYPXYLON

Ascophore subglobose or forming crust-like patches, solid, perithecia immersed in a row just below the surface (spores 1-celled, brown).

Differs from *Daldinia* in the flesh not showing concentric zones or lines. The surface of the ascophore is usually minutely warted owing to the slight projection of the mouths of the perithecia. When a section of the ascophore is examined under a pocket lens, the perithecia, more or less flask-bodies containing the spores, are seen arranged in one or more rows close to the circumference. These perithecia contain numerous asci, each of which contains 8 brown spores. These details of the structure can only be seen when a thin section of the periphery of the ascophore is examined under a microscope.

*H. coccineum* (Pl. XXXVIII, fig. 3).—Ascophore subglobose, vermilion-brown, bright black within, surface rough with the projecting mouths of the ovate perithecia, about  $\frac{1}{4}$  in. across, but size variable (spores elliptical, dark brown).

Most frequently round and about the size of a pea, but not unfrequently several grow into each other, forming large patches. When young the ascophore is covered with rusty brown, tufted and branched strands of hyphæ which bear minute conidia. These eventually disappear, leaving the ascophore naked and more or less smooth, afterwards warted with the mouths of the projecting perithecia. At this stage the surface is bright rust-colour bordering on vermilion, becoming rusty black when old.

On old beech trunks, etc. Common.

*H. fuscum*.—Ascophore convex or cushion-shaped, brown or purple-brown, at length black, 1–3 lines across, perithecia globose (spores almond-shaped, dark brown).

Forming subglobose warts smaller than split peas. At first covered with a rusty or purple-brown bloom, gradually increasing in thickness, at length naked and black. When old, pierced with numerous minute perforations.

Gregarious on hawthorn, hazel, etc. Common.

*H. rubiginosum*.—Ascophore crust-like, effused for 2–4 in., thin, covered with bright rust-coloured powder, at length naked and black; mouths of the perithecia rather prominent (spores elliptical, dark brown).

Forming longitudinally spreading patches. Perithecia prominent on the surface.

On decorticated wood.

## DALDINIA

Ascophore sessile, subglobose, surface smooth, with a peripheral layer of oblong perithecia opening to the surface, blackish, internally blackish and distinctly concentrically zoned.

Differs from *Hypoxylon* in having a large number of concentric zones or rings in the flesh.



PLATE XXXVIII

1. XYLARIA HYPOXYLON
2. HELVELLA CRISPA
3. HYPOXYLON COCCINEUM
4. HIRNEOLA AURICULA-JUDÆ
5. SPATHULARIA CLAVATA
6. CLAVARIA RUGOSA
7. OTIDEA LUTEO-NITENS
8. MORCHELLA ESCULENTA
9. XYLARIA POLYMORPHA



PLATE XXXVIII.





*D. concentrica*.—More or less globose, smooth, brownish black, solid; flesh dry and brittle, almost black, marked with a number of concentric rings which are seen when it is cut across,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. across, sometimes larger (spores elliptical, brown).

If a mature specimen is placed on white paper, a dense mass of spores, resembling a layer of soot, will be deposited on the paper round the specimen.

On decayed trunks, posts, etc. Solitary, or generally in clusters.

### XYLARIA

Ascophore vertical, stipitate, solid, externally black, inside white; perithecia embedded in the periphery (spores obliquely elliptical, brown).

The ascophore grows erect, and is often more or less club-shaped, and such species are often mistaken for species of *Clavaria* by beginners. Most species produce a conidial form of reproduction before the ascigerous form is developed. In some kinds the conidia are snow-white, and produced in abundance at the tips of the branches.

*X. polymorpha* (Pl. XXXVIII, fig. 9).—Ascophores clustered, cylindric-clavate or irregular in form, black, surface almost even, flesh white, perithecia in a peripheral row (spores elliptical, brown).

Ascophore 1–3 in. long and  $\frac{1}{2}$  in. or more in diameter. Resembling black, finger-like bodies, narrowed at the base.

On old trunks and stumps. Common.

*X. hypoxylon* (Pl. XXXVIII, fig. 1).—Ascophore erect, rather corky and tough, simple or branched, the tip often flattened and more or less branched like a stag's antler, black, lower portion velvety, tips at first densely powdered with snow-white meal or conidia, which finally disappears, and the upper portion of the ascophore becomes minutely nodulose or warted, owing to the development of the perithecia, 1– $2\frac{1}{2}$  in. high, rather slender.

The ascophores are usually tufted, jet black, excepting when the tips are snow-white with conidia. In this condition the fungus is a very conspicuous object, and in some districts is known as the "candle-snuff fungus."

On stumps, chips, fallen branches, etc. Very common.

*X. carpophila*.—Ascophore erect, unbranched, slender apex pointed, black, tip at first powdered with white conidia, then naked and black like the remainder; stem long, root-like (spores elliptical, brown).

About 1 in. high, sometimes more. Gregarious.

On old fallen beech-mast. Not uncommon.

*X. vaporaria*.—Ascophores erect, conical, bearing perithecia only on the lower half, the upper portion being of a brownish



colour, the lower part black, 1-2 in. long, rather slender. The ascophores spring from thick black, prostrate, very irregular branches or sclerotia, which are imbedded in the soil.

The ascophores are wrinkled and often crooked. The sclerotia are very abundant and develop rapidly. I have seen a barrow-load of sclerotia removed from a cucumber frame, the growth of a single season.

Among soil in cucumber and melon frames, mushroom beds, etc.

### PORONIA

Ascophore discoid, flattened, stalked, substance between fleshy and corky; perithecia immersed, their mouths opening on the flattened upper surface of the ascophore (spores elliptical, 1-celled, coloured).

Cannot be confused with any other genus on account of the peculiar form of the ascophore, which resembles a large flat-headed nail, the under surface running gradually down into the somewhat slender stem.

*P. punctata*.—Ascophore stipitate, upper surface flat, circular in outline, whitish, dotted with the black mouths of the perithecia,  $\frac{1}{4}$ – $\frac{2}{3}$  in. across, gradually narrowing downwards into the stem, blackish below,  $\frac{1}{2}$ –1 in. high.

On dry horse and cow dung. Rare.

### CORDYCEPS

Ascophore vertical, clavate or subglobose, stipitate (spores needle-shaped, many-celled, colourless). Parasitic on insects.

A very interesting genus of fungi, some of which will be likely to be mistaken for species of *Clavaria* by the beginner. All are parasitic on insects, and infection usually takes place during the caterpillar stage, when the spores are either swallowed along with the food plant or enter the body through the spiracles. After infection the caterpillar continues to live for some time, and usually passes into the chrysalis condition, when it is killed by the mycelium of the fungus, which usually converts the entire substance of the chrysalis into a dense web of cork-like substance, the skin of the chrysalis remaining intact. In other instances the insect is killed during the caterpillar stage. As a rule, two distinct forms of reproductive bodies, a conidial stage, followed by an ascigerous or more highly evolved condition, are produced. After the caterpillar or chrysalis, as the case may be, has been dead for some time, the conidial form of fruit is formed, which usually consists of a more or less feathery, branched tuft of silky-looking mycelium,  $\frac{1}{2}$  in. or more in height, which is powdered with the very minute conidia. Eventually the conidial form of reproduction entirely disappears, and is followed in due course by the ascigerous form, which, as

already stated, consists of a more or less club-shaped or subglobose head, supported on an erect stem, varying from  $\frac{1}{2}$ – $1\frac{1}{2}$  in. in length. In other countries the ascigerous condition is much larger than in British species, sometimes exceeding six inches in length. The largest species are met with in New Zealand. In some instances the fungus is produced on the imago or perfectly developed insect, and in some cases the insect flies about for some time with the fungus projecting from its body before it dies of exhaustion caused by the parasite. Moths and butterflies suffer most; but wasps, bees, beetles, and spiders are also attacked. Myriads of insects are killed every year by these fungi, which occur wherever their hosts are present.

### TORRUBIA

Characters of the genus the same as in *Cordyceps*, but the species are parasitic on fungi.

By many authors, myself included, this genus is included in *Cordyceps*, but in a book primarily intended for beginners it is considered important to make everything as easy as possible, so that the tyro may arrive at the name of any given fungus met with. For this reason *Torrubia* is kept distinct from *Cordyceps*, for the simple reason that all species of the first-mentioned genus are parasitic on insects, whereas all species belonging to *Torrubia* are parasitic on other fungi. In this connection, however, it is very important to remember that to discover what particular host the fungus is attached to can only be determined by careful observation. On discovering the fungus growing among moss or on the ground, if it is simply pulled up the chrysalis or fungus on which it is growing will be left behind, consequently it is important that the fungus should be dug up to ascertain what it is growing from, and as the species of *Elaphomyces* or truffles are usually two or three inches down in the ground, a certain amount of care and perseverance is necessary.

*T. ophioglossoides*.—Ascophore clavate, fleshy, brownish black, minutely rough owing to the projecting mouths of the perithecia; stem cylindrical, olive, becoming dusky, entire fungus 2–3 in. high (spores needle-shaped, colourless, many-celled).

Solitary or in small clusters. Parasitic on a fungus called *Elaphomyces muricatus*, one of the truffle family, about the size of a walnut, and buried to a certain depth in the ground.

The whereabouts of the *Elaphomyces* is often betrayed by its parasitic *Torrubia*, which appears above ground. The flesh of the *Torrubia* is yellow. Met with mostly under conifers.

*T. capitata*.—Ascophore ovate to globose, fleshy, about the size of a pea, bay-brown; stem yellow, becoming dusky, entire fungus 2–4 in. long (spores needle-shaped, colourless, many-celled).



Under conifers, parasitic on the false truffle called *Elaphomyces granulatus*, a fungus about the size of a walnut, buried in the ground. The *Torrubia* is sometimes entirely lemon-yellow when young, becoming dusky with age. If either of the above species of *Torrubia* is encountered and carefully removed along with the fungus on which they are parasitic, two birds are killed with one stone, or two distinct and interesting fungi are secured and their names determined.

### CLAVICEPS

Developing in the inflorescence of grasses and sedges, usurping the place that would normally have been occupied by the ovary or grain; at first forming a hard, solid, black, horn-like sclerotium which bears a conidial form of reproduction. This sclerotium falls to the ground, and the following spring produces the ascigerous form of fruit, which consists of a subglobose head supported on a slender stem (spores needle-shaped, colourless, many-septate).

A very remarkable and interesting genus. The stigma of the flower of a grass or sedge becomes infected by the spores of the fungus brought by some insect visiting the flower. The spore germinates on the stigma, and the mycelium grows down into the ovary, where it appropriates the food intended to nourish the grain or seed that should under normal conditions develop there. Instead of this the fungus grows out as a long, black, slightly curved body which bears minute conidia on its surface. These conidia are carried by insects to other grasses, which in turn become infected. When the grass is ripe the black sclerotia fall to the ground, where they remain in an unaltered condition until the following spring, when they give origin to one or more subglobose ascophores or heads supported on slender stems. Spores produced by these ascophores are produced in the spring, escape and are carried by wind, etc., on to the stigmas of grasses, and the course of development commences anew.

*Claviceps*, or "ergot," as it is commonly called, is one of the few fungi that is used medicinally, and proves to be of considerable value in certain cases. A decoction of the sclerotium is the part used as a medicine.

### EPICHLOE

Parasitic on the stems of grasses. Ascophore encircling the stem, white, then orange-colour, surface rough with the projecting mouths of the perithecia (spores needle-shaped, colourless).

*E. typhina*.—Ascophore or stroma growing round the stems of various grasses as a thin crust, at first white, then deep orange-colour, enveloping the stem near the top for a distance of 1 in. or more, the surface becoming minutely rough, due to the projecting

mouths of the perithecia (spores very long, needle-shaped, eventually many-celled, colourless).

Readily recognized by forming a deep orange-coloured belt or zone round the upper portion of the stem of various grasses, *Holcus lanatus*, *H. mollis*, *Agrostis canina*, etc. In some parts of the country it is known as the "reed-mace fungus."

Fortunately this parasite only attacks wild grasses; if it also infested cereals it would be a very serious matter, as the plants attacked never bloom, and I have seen practically every plant of *Agrostis canina* extending over an area of many acres on Albury Heath, infested with the fungus. It is also often abundant on grasses growing on the borders of fields, etc. According to a French authority, when hay containing a considerable amount of grass infested with this parasite is eaten by horses, it proves injurious and causes coughing.



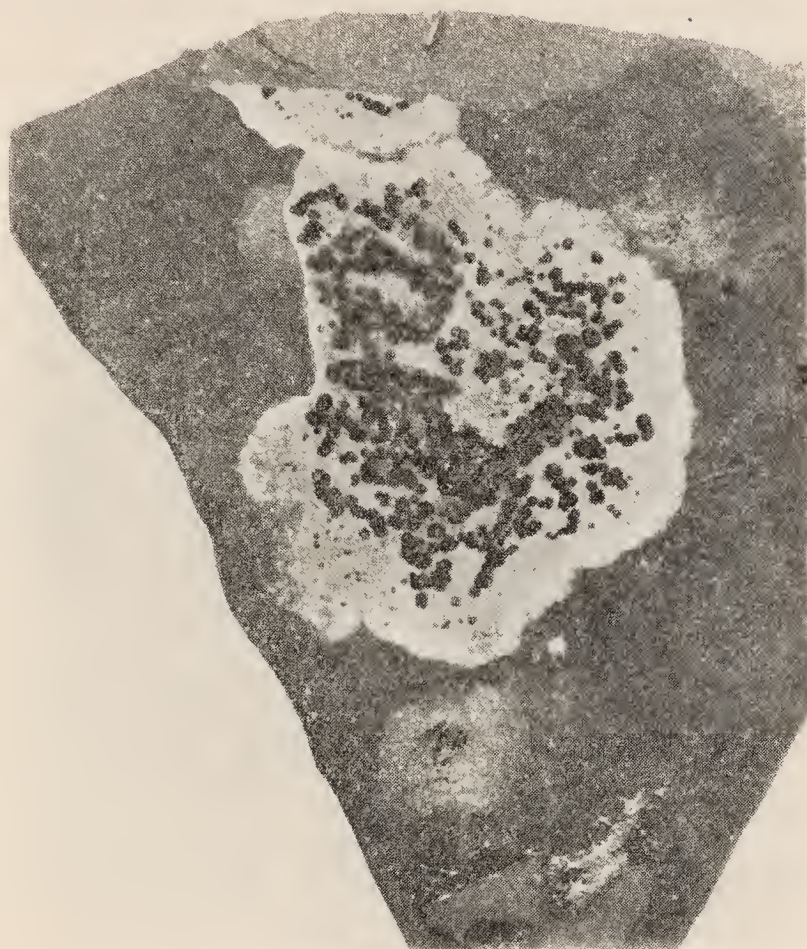
## LICHENS

THE primary object of this chapter is not to describe the species of lichens met with in this country. There are two reasons for this statement: (1) My inability to do so; (2) as there are, in round numbers, 2000 British species, the requisite space is not forthcoming in a single volume. What should be done, and what I hope may be done, is the production of a volume devoted solely to the study of this beautiful and highly interesting group of plants.

During mycological rambles the student is certain to meet with many of the commoner species of lichens, which in many instances, superficially, so closely resemble certain groups of fungi, both in habit and general appearance, that a few hints on the principal points of distinction between fungi and lichens may be acceptable. In the second place, some of the larger, frondose lichens, that cannot be mistaken for fungi, are fairly abundant and are certain to attract attention, and it is just as well that the names and affinities of such forms should be known. With this object in view, two plates of figures of lichens are given, mainly for the purpose of enabling the student to gain some idea of the general appearance of the various types of plants collectively constituting the Order Lichenes, and not with the idea of indicating definite species.

One very pronounced difference between fungi and lichens turns on the nature of the food. In fungi, it will be remembered, organic food is required; whereas in lichens inorganic food—that is, carbonic dioxide obtained from the air, and certain salts and other substances in solution in water—are required. The above is the distinction between lichens and fungi, so far as food is concerned, as usually given in text-books, and, broadly speaking, it is correct; but if we investigate the matter in detail, we find that there are exceptions to the rule. Some lichens are injurious parasites on living leaves and branches, and the mycelium of certain fungi often appear and grow vigorously in dilute solutions of mineral acids or salts. Owing to the nature of their food, fungi are never pioneers, or the first signs of life to appear in a previously sterile region; whereas lichens, whose food is supplied by the air and the soluble portions of disintegrated rock, are amongst the first living organisms to appear in those inhospitable regions where no other form of life could exist. This is rendered possible by the peculiar constitution

of the plants belonging to this group. They can resist without injury greater extremes of heat and cold than any other known plants, and also possess great power of adaptability. They are of very slow growth, and appear in many instances to live for a very long period of time, more especially those species forming crusts on rocks.



*Lecidea subumbonata*, a lichen growing on rocks  
in Alpine districts

In the cold regions of the north lichens frequently serve as an important source of food to animals, as in the case of the reindeer, who during a certain season of the year depend almost entirely on a certain lichen, *Cetraria rangiferina*, curiously enough called reindeer moss, for their food. As food, lichens have more than once saved the lives of explorers in the Arctic regions. The nutritious property of lichens turns on the presence of a substance called lichenin, or lichen-starch, whose chemical composition is the same as that of starch proper. In the higher forms of lichens this substance is present to the extent of 40–65 per cent of the entire bulk. A lichen called *Lecanora esculenta* grows loosely attached to rocks in the north of Africa, from which it is removed and carried for long distances by wind, and in desert districts where food is



scarce is eaten by the inhabitants. This lichen is supposed to have been the "manna" of the Children of Israel.

Dyes of various colours are yielded by lichens, the best known and most important being variously known as "orchil," "cudbear," "orseille," "litmus," etc., which has been used from the earliest historical times. As "litmus," it is still used in chemical research as an agent for determining the presence of acids or alkalies respectively. It is obtained from a lichen called *Rocella tinctoria*, found in many parts of the world, growing on rocks by the sea-shore.

The most remarkable feature in connection with the study of



*Sticta pulmonaria*, a lichen growing on trees

lichens is that of their dual nature, a subject which can only be briefly alluded to in this book.

During earlier times it was naturally assumed that lichens, like mosses, ferns, fungi, algæ, and other plants, were entities. Some time ago, however, it was clearly demonstrated that all lichens are in reality composed of a fungus and one or more algæ, living together and collectively constituting a lichen. The fruiting portion of a lichen is always produced by its fungal constituent. This combination of two plants belonging to totally different families to form a third plant having marked characteristics of its own may at first sight appear to be strange, to say the least, but it has its parallel, in a less marked manner, in other groups of the vegetable kingdom.

In dealing with the fungi it has been stated that parasitism is an acquired habit, and that all degrees of parasitism, in the case of

fungi attacking higher plants, can be observed at the present day. Incipient parasites often promptly kill their host-plant ; whereas, at the other extreme, many parasites do not kill the host-plant, neither, so far as our knowledge goes, do they cause the slightest inconvenience, and in some instances the presence of the parasite actually appears to benefit the host-plant. When parasite and host have reached the point, through a long series of struggles against each other, of mutually aiding each other, and doing more for their welfare when working in unison than either could do as a separate



*Cladonia rangiferina*, Reindeer moss

individual, the terms “ mutualism ” or “ symbiosis ” are used to express this condition of things. Instances are known where fungi and flowering plants appear to have attained to this condition of mutualism, and colonies of algæ are also invariably present in the tissues of certain flowering plants.

In all probability fungi were in the first instance parasitic on algæ, and through a long series of years this primitive parasitism has gradually evolved into mutualism, the result being our present lichen flora.

*Cladonia cornucopioides* (Pl. XXXIX, fig. 1).—A common and very beautiful lichen, growing on the ground on heaths in lowland



PLATE XXXIX

1. CLADONIA CORNUCOPIOIDES
2. USNEA BARBATA
3. EVERNIA PRUNASTRI
4. PELTIGERA CANINA





1



2



3



4





and subalpine districts. Many bright vermilion-red tubercles grow from the edge of the funnel-shaped upper portion of the stem. These tubercles closely resemble the perithecia of certain fungi, and if a thin section through one is examined under the microscope the asci containing spores can be seen.

*Cladonia rangiferina* (reindeer moss).—This is a very common lichen on heaths in lowland, subalpine and Alpine districts, growing on the ground. In this country it varies from 3–6 in. in height,



*Cladonia pyxidata*

pale greenish grey or sometimes almost straw-colour. Like the grasses, it is a social plant, and in Lapland covers vast tracts of country, and growing to a height of 6–12 in. In winter it practically forms the only food of the reindeer, who clear away the snow by means of their horns to browse on the lichen. It is also collected as fodder for cattle.

Other species closely resembling the present grow on the ground on our heaths and moors.

*Cladonia pyxidata*.—One of the commonest and at the same time, within certain limits, one of the most variable of lichens.



Colour greenish grey. The apothecia are brownish in colour, and grow round the edge of the funnel-shaped cup.

On banks, stumps, etc.

*Cladonia gracilis*.—Ashy grey or greenish grey, long and usually tapering to a point; apothecia or fruit bodies brownish.

On the ground on heaths, etc. Common.



*Cladonia gracilis*

*Usnea barbata* (Pl. XXXIX, fig. 2) (tree-moss or beard-moss).—Greyish green or straw-coloured. When young it usually grows erect and is rigid, becoming limp and pendulous or drooping when older. Common on old forest trees, more especially conifers, which are often coated with dense, shaggy fleeces, varying from a few inches to a foot in length. It is very widely distributed over the

world, and in some parts is eaten by wild animals, and is also collected as fodder for domestic animals. It also yields an orange dye.

*Peltigera canina* (Pl. XXXIX, fig. 4).—A very widely distributed species, common in this country, and ranging from lowland to Alpine regions. It occurs in somewhat moist situations among moss, on mossy trunks and stumps, on stones or on the ground. When quite moist and growing it is often deep green in colour, but in dry weather changes to a greyish green or brownish colour. The under surface is spongy and whitish in colour, with a network of brownish veins from which spring tufts of fibrils by which the plant is attached to the substratum. The fruit consists of chestnut-coloured lobes having the edges incurved, and springing from the edge of the thallus or flattened portion of the plant. The plant was at one time considered a specific against hydrophobia, hence its specific name.

*Evernia prunastri* (Pl. XXXIX, fig. 3).—A very common lichen on trees, rails, palings, etc., in lowland and subalpine districts. It grows abundantly on fir trees, and is also common on plum and other fruit trees. It can be readily known from other species somewhat similar in appearance by its pendulous or drooping habit and the white colour of the under side of the branches. The upper surface is pale glaucous or greyish green, and the general surface is more or less lacunose or with depressions bounded by irregularly branching ribs. It sometimes also grows on rocks and stones.

*Physcia parietina* (Pl. XL, fig. 5).—This is at the same time one of our commonest and most beautiful of lichens, is yellow or orange-coloured, more or less circular patches occurring on pebbles, rocks, slates or tiles on the roofs of houses, also on wood and branches. Old hawthorn bushes are often beautifully decorated. In moist, shady localities it is often greenish or with a blue tinge. It furnishes a yellow colouring matter, which in bygone times was extensively used by the peasantry in various countries for dyeing woollen goods. On account of the presence of a bitter substance it was at one time recommended as a substitute for quinine. On dead branches this lichen figures largely in cases of stuffed birds.

*Lecanora tartarea*.—Forming whitish or greyish white, much cracked crusts, studded with the brownish apothecia.

On rocks. Not uncommon.

*Lecidea contigua*, var. *calcareo* (Pl. XL, fig. 3).—Forming a whitish, cracked crust, much cracked and studded with numerous circular, black apothecia or fruiting bodies.

On rocks. Common.

*Verrucaria maura* (Pl. XL, fig. 2).—Forming thin black patches of very irregular shape and size on maritime rocks and pebbles. This species is only met with in the neighbourhood of the sea. On



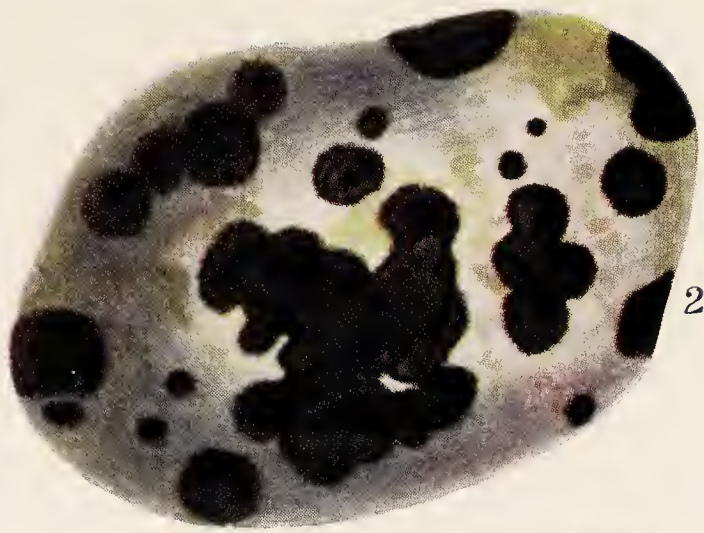
## PLATE XL

1. *GRAPHIS ELEGANS*
2. *VERRUCARIA MAURA*
3. *LECIDEA CONTIGUA*, VAR. *CALCAREA*
4. *PANNARIA RUBIGINOSA*
5. *PHYSCIA PARIETINA*
6. *CONIOCARPON GREGARIUM*

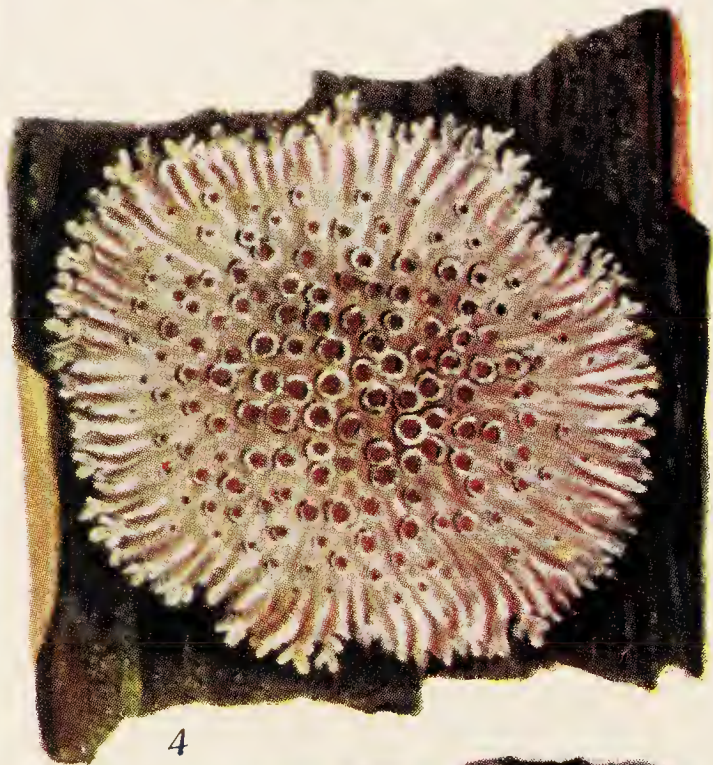
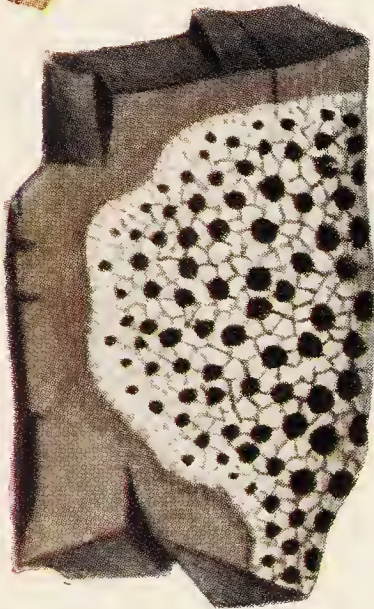




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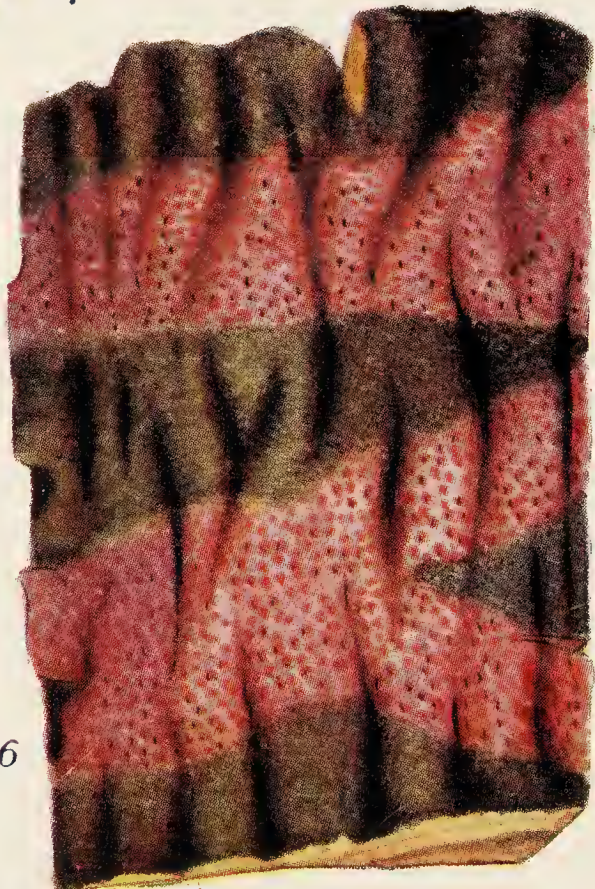
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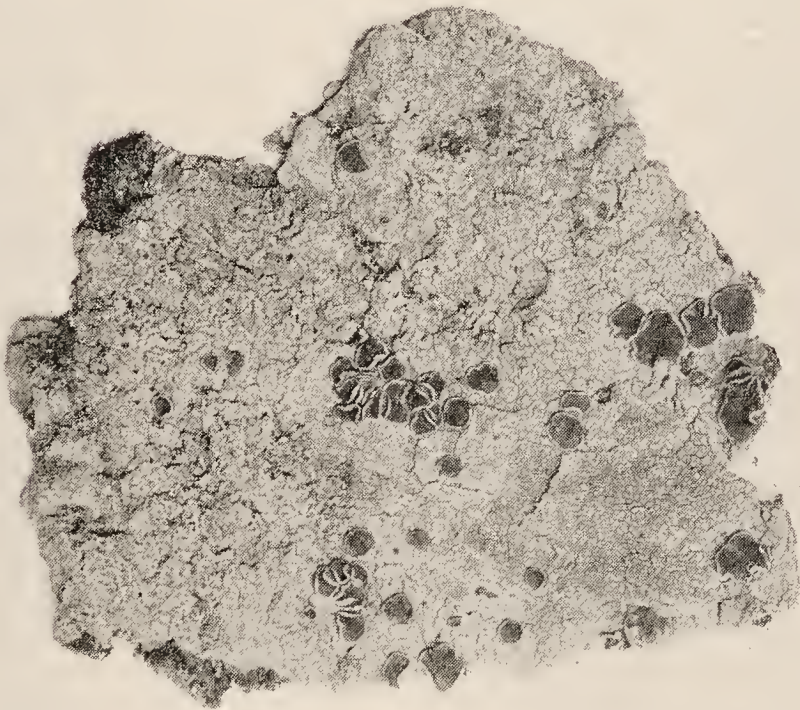
the shingly beach at Pevensey Bay nearly every pebble above high-water mark is more or less covered with this lichen.

*Graphis elegans* (Pl. XL, fig. 1).—Pale cream-colour or greyish white, with numerous straight or curved, rather prominent blackish lines which are in reality the fruit of the lichen. It grows on the bark of various trees, but is perhaps most beautifully developed when growing on the bark of the holly.

Several closely allied species grow on the bark of trees, and the genus is recognized by the apothecia or fruit-forming, variously curved or branched, black lines on a whitish ground, resembling Arabic writing characters.

*Pannaria rubiginosa* (Pl. XL, fig. 4).—This beautiful lichen grows on mossy rocks or trunks of trees.

*Coniocarpon gregarium* (Pl. XL, fig. 6).—This is not a British lichen, but has been found on the bark of imported wood.



*Lecanora tartarea*





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